JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

OCTOBER, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Steam and its Condensation. By THOMAS PROSSER, C. E.

(Continued from page 80.)

CHAPTER VIII—PART II.

The second part of my subject—the surface required for the condensation of steam—was not determined by the *experiments*, further than the previously recorded fact, that it was greatly exceeded in the apparatus used; it amounted to 47 superficial feet, or nearly half the boiler water-heating surface. I have no doubt that, with thin steel, instead of iron tubes, one-fifth will be found sufficient. The foundation of this belief is to be found in the fact that, when the condensing water was at 55° F., the steam water* was frequently below 100° F., instead of being about 200° F., which is the ordinary temperature.

If the steam-water can be forced into the boiler at this latter temperature, the heater-condenser may be dispensed with; but, to insure the action of the feed pump, it appears desirable that the water in the reservoir be at a temperature of some 20° to 30° F. below that of the superincumbent steam, for the purpose of insuring solid water.

* I beg leave to be allowed the use of the following terms for the sake of brevity, and to avoid repetitions:

Steam-water	for condensed steam or water of condensation.
Pistonage	for the steam space displacement of the piston.
Clearance	for the space at each end of the cylinder beyond the piston range.
Passages	for the steam passage from the cut-off to the cylinder.
Leakage	for the steam leakage by the piston and exhaust port.
Total Power	for the mechanical power developed by converting one pound of water from the boiling point into steam.—See this *Journal*, vol. XXXVI. (3d Series), p. 7.

Still it may be a question whether, on board a ship, it is worth the space occupied; *I* believe it will always be found so, as the space over the distilling condenser can seldom be appropriated to any other purpose; and, moreover, the apparatus appears not liable to the least deterioration, or to give the slightest trouble, so far. In fact the whole condenser and boiler may claim the same immunity; for, after eighteen months in one case, and more than two years in another, of constant use, not the slightest trouble or difficulty of any kind has occurred.

One-tenth part of the boiler water-heating surface will be sufficient for the heater-condenser, and the same for the still-condenser, of a sea-going steamer requiring distilled water for the use of the ship.

These questions, however, have not been determined experimentally, on account of the want of steam to test the power of the condenser, and therefore some modification may be found desirable hereafter; but the paramount consideration, *the supply of distilled water to recuperate the waste from the boiler*, is placed beyond a doubt, even if that waste, including as it does all the steam condensed in the cylinder, be three times the amount which we know it has not exceeded. It may surprise many to be told what the amount of this waste of boiler water really is. In the "*Fulton*" and "*Arago*" I have the best authority for stating it to be 25 per cent., for their surface condensers would supply but three out of the four boilers with fresh water, even when the boilers and condensers were comparatively new.

Of the "*San Jacinto*" with her old copper boilers "in good condition,"* and not two years old, and with new condensers, it was said, "The condensers *performed well*, furnishing *more* than enough fresh water for two out of the three boilers."† I quote the exact words which will some day be read with astonishment. If this is "*performing well*," it makes rather an interesting inquiry of what performing bad means.

How much more than two-thirds of the steam was returned to the boiler as fresh water, we are not informed, but presume it was not three-fourths. In fact these expensive boilers were a wreck in four years afterwards,‡ having been in commission but five and a half altogether.

This waste of water is almost entirely from the boiler. The steam-water from condensation in the cylinder is too valuable to be thrown away, and as to superheating the steam sufficiently to prevent it, that is impossible, without incurring the greatest danger and encountering difficulties as great if not greater than that to be overcome.

The first part of this chapter closed with showing an evaporation equivalent to 12 pounds of water with 1 pound of coal. Of that 12 pounds of water, however, I claim but 10 pounds as *bona-fide steam*, after it had left the cylinder *and entered the condenser*. It does not follow, however, that the remaining 2 pounds were wasted, and therefore have to be restored to the boiler, for the half of that had its equivalent in superheat of the steam, and therefore we have only actually to provide for the other half, or about 8·2 per cent., which, as before

* Jour. of Franklin Inst., vol. 28 (3d Series), p. 128.
† Ibid, p. 130. ‡ Ibid, vol. 38 (3d Series), p. 8.

stated, was the real deficiency of every kind and from every source, a deficiency which is less than *one-third* the ability of the distilling condenser to make good.

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CHAPTER VIII—PART III.

Having disposed of the equivalent of one pound of water converted into steam, as superheat in the whole body of the steam generated, and of one pound of water which disappears, whether as water or as steam, we come to that of the ten pounds of *pure steam* as I contend the remainder to be. If not *pure steam*, the test to which I shall submit it will soon discover it, and, at the same time, fully test the accuracy of the forthcoming Report of the Board of Inquisition, for that in its most objectionable form is its character.

Personally, I have the greatest respect for the individual members of that board, and for the faithful and able manner in which the experiments were conducted. But the objectionable part of the proceedings is (in accordance no doubt with red tape precedents and official dignity) that the Report, instead of being submitted to the person supposed to be *individually* more particularly and understandingly interested therein than any other, is "*hid from his sight*," and sent off to one who is not necessarily supposed to know or to care anything about it; so that if there are any damning errors in the Report, they are discovered too late to be amended, and "*Ruin*" may sign as one of the board. Is it too much to imagine that a Board composed of U. S. Marine Engineers may fail to appreciate at its true value, an invention necessarily new, unknown and untried, which upsets the whole theory in which they have been educated, and sacrilegiously tears away the air-pump from the shrine in which its idolizers have placed it? Had there been discussion in open court on all debatable subjects, surely the Report could not have suffered in efficacy from that cause, and I should have no need to lay this anchor to windward. As I do not intend to leave anything to mere imagination, I have carefully measured the cubical contents of the steam engine, for the purpose of ascertaining the amount of steam, that is to say of the ten pounds which is effective, premising that, excepting the salvage of the exhaust steam, all which is used in clearance and passages is *lost*, whether working with or without expansion, provided the calculation be made at the end of the stroke.

The cut-off does not entirely regulate the expansion, but it is the whole steam which passes it up to the period of cutting off, and which of course includes not only the due portion of the pistonage, but also that of the whole of the clearances and passages.

In the case in question the steam was cut off at 5·076 in. of the 18 in. stroke, or as 1 to 3·5461, but the real steam expansion is as 1 to 2·778527. The former represents, at the moment the steam is cut off, the proportion which the pistonage then bears to the whole pistonage, viz: as .2909757 ft. to 1·0318288 cubic feet, while the other represents the proportion which the whole steam which has passed the

cut-off valve at the same moment, bears to the whole capacity of the cylinder, clearances and passages combined, viz: as ·4165543 ft. to 1·157407 cub. ft.

Without expansion the "*abstract* practical value" of the steam which it is the object of this portion of our paper to elucidate, is reduced by three causes. First, the clearance and passages; second, the leakage; and third, the back pressure of the steam upon the piston.

	Cub. in.	Cub. ft.
The Pistonage per double stroke is . .	1783 =	1·0318288
" " clearance, and passages,* .	87 =	·0503472
Totals,	1870 =	1·0821760

The steam engine made 21,600 double strokes (in 8 hours) with 2565 lbs. of steam, that being the weight of steam-water actually caught.

It was found upon trial with the fly-wheel of the engine scotched, that, about five per cent. was lost by leakage. We have therefore to account for ninety-five per cent., or 2436·75 lbs. of the steam-water, as having been working steam, and therefore

$9{\cdot}5927 = \left(\frac{1{\cdot}0821760,21600}{2436{\cdot}75}\right)$ cubic feet of such working steam weighs 1 lb., corresponding with 45·5 lbs. per square inch of pressure, and 135° C. of temperature.

Steam at this pressure has a total power equal to lifting 1 lb. 62·916 feet, but only $\cdot953477 = \left(\frac{1{\cdot}0318288}{1{\cdot}0821760}\right)$ of it is available.

The back pressure upon the piston was 16 lbs. per square inch, which leaves an unbalanced steam pressure of $29{\cdot}5 = (45{\cdot}5 - 16)$ lbs. per square inch; so that even of the working steam, only $\cdot648352 = \left(\frac{29{\cdot}5}{45{\cdot}5}\right)$ is available in *work done*, or of the whole working steam effective in work done $\cdot618188 = (\cdot953477 \times \cdot648352)$. Taking the whole 10 lbs. of steam which entered the cylinder, only ·5872786 was available in *work done*. Hence we have H. P. $11{\cdot}1966 = \left(\frac{\cdot5872786,62,916}{33,000}\right)$ from the evaporation of 10 lbs. of water with 1 lb. of coal per minute. This is but ·893122 lbs. of water per minute per H. P.

The coal was therefore 5·35873 lbs. per hour per H. P., and, as the coal used was 32 lbs. per hour, the power developed was $(32 \div 5{\cdot}35873) = 5{\cdot}97156$ H. P.

In order to show the extravagance in fuel by using steam of so low a pressure, we will calculate the known certain effects of applying the steam at 160 lbs. pressure per square inch, with the same back pressure as before, viz: 16 lbs. to the square inch.

We have available as before ·953477, and hence

H. P. $17{\cdot}4115 = \left(\frac{\cdot953477,\ \frac{144}{185},\ \cdot95,\ 70,481}{33,000}\right)$ The total power at this pressure is equal to lifting 1 lb. 70·481 feet, ·95 of which is available

* There is a salvage from this in the exhaust steam, which I have not thought worth deducting.

as before. Now, 17·4115 H. P. by the evaporation of 10 lbs. of water with 1 lb. of coal, is ·57433 lbs. of water per minute per H. P.

The coal 3·446 lbs. per hour per H. P.; and, as that is calculated as before at 32 lbs. per hour, the power developed is (32 ÷ 3·446) = 9·2861 H. P., or more than 50 per cent. of increase, by merely increasing the pressure of the steam, which pressure is perfectly safe, as any competent person will declare, after an examination of the boiler.

Comparative Analytical Development of Power by the Two Pressures.

Full pressure of the working steam per sq. in. in lbs.,	45·5	160
Unbalanced pressure of the working steam "	29·5	144
Loss by cylinder leakage, . . .	·50	·50
" " passages and clearances, .	·44	·44
" back pressure upon piston, . .	3·19	·91
Available in *work done*, . . .	5·87	9 13254
		10·98254
Gain in total power, by increase of pressure, .		·98254
Total cost,	10.	10.

I must now close this chapter, reserving for another the consideration of expanded steam, which is of sufficient importance to claim one to itself.

(To be Continued.)

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*Simple Method of Calculating Earthwork.**

To the Editor of the Civ. Eng. and Arch. Journal.

In your May number, A. S. W. describes a method of calculating the contents of cuttings, and asks if it has ever been previously used. I may inform you that the same method has been used by me for some years, but I never looked upon my application of it as a *discovery*, for I thought it would be sufficiently obvious to any person with a slight knowledge of mathematics, who might have frequent occasion to measure irregular solids.

The method was first suggested to me in 1846, when investigating the proper system of ascertaining the cubic contents of walls built to

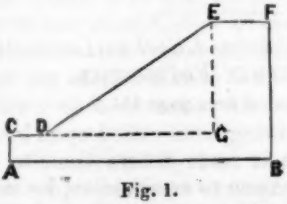

Fig. 1.

Fig. 2.

support the slopes of embankments. I was then engaged in forming reservoirs at Whittle Dean, for the water supply of Newcastle-upon-Tyne. The walls of our grating tanks were of the form shown in the two figures: Fig. 1 being an elevation of the wall, and Fig. 2 a section of the same at E.

* From the London Civ. Eng. and Arch. Jour., July, 1859.

The upper surface of the walls, or where they coincided with the slope of the embankment, as on C, D, E, F, was of uniform breadth, the face was perpendicular, and the back battering. In measuring the contents of the triangular portion D, E, G, it seemed at the first glance that a near approximation would be attained by multiplying the length D G, by half the height E G, and this again by an average thickness found by taking one-third of the sum of the thicknesses at the angles. I soon found that not an approximation only, but the exact contents was the result. Subsequent investigation showed me that this method was coincident with, and directly deducible from, the prismoidal formula.—For let us call a, b, and c, the thickness at D, E, and G respectively, l = the length D G; h = the height E G.

For wider application I take a different symbol for the thickness at each angle. Then "*the sum of the areas of the ends added to four times the area of the middle section, and multiplied by one-sixth of the length will give the contents.*"

Area at D $= a \times o = o$. Area at E G $= \frac{b+c}{2}\, h$.

Four times area of middle section $= 4 \times \frac{1}{2}\left(\frac{a+b}{2} + \frac{a+c}{2}\right)\frac{h}{2} = \left(a + \frac{b+c}{2}\right)h$

$$\text{Content} = \left[o + \left(a + \frac{b+c}{2}\right)h + \frac{b+c}{2}\, h\right] \times \frac{l}{o} = \frac{a+b+c}{3} \times \frac{l\,h}{2}$$

which last expression is the method of A. S. W.

The prismoidal formula admits of very wide application, and I find it useful in calculating the contents not only of cuttings, but of conic and pyramidal frustrums, and in various ways.

Hexham, May 10, 1859. T. D. Ridley.

The applicability of the prismoidal formula to cones, wedges, spheres, &c., is shown by Mr. Ellwood Morris, Civ. Eng., of Philadelphia, in the *Journal of the Franklin Institute*, vol. xxiii, page 241, year 1852. The application to embankments and excavations, the measurements of masonry, &c., has been general on our public works from the date of their commencement. *Ed. Jour. Fr. Inst.*

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*On the Relative Values of Coke and Coal in Locomotive Engines.**

By Benjamin Fothergill.

(Continued from page 154.)

Mr. John Braithwaite, having been called upon by the Chairman, said that having the intention at some future time to bring forward some views of his own in reference to combustion, he must decline entering fully upon the subject that evening. He had listened with attention to the remarks of the last speaker, and there were several of his views which, in the paper that he hoped to be allowed to bring before the Society at a future period, he should endeavor to controvert. Whether it was a question of using coal or coke, he believed

* From the Jour. of the Society of Arts, No. 339.

the present arrangement of furnaces and the manner of producing combustion were very far behind what he hoped would ultimately be arrived at. He thought that, ere long, the boilers of engines would be constructed of a different form, so as to produce more efficiently the draft in the furnace, not precisely after the plan which he (Mr. Braithwaite) brought forward in 1829, but such an improvement upon it that the combustion would be steadily carried on and the gases essential to the generation of steam would be given out without the use of the diffuser to which allusion had been made. This principle had been carried out in the caloric engine, and had been found, so far, successful.

The CHAIRMAN was gratified to hear that it was Mr. Braithwaite's desire to give them the benefits of his practical experience in these matters.

Mr. BRAITHWAITE would be glad to do so, and for that reason he would not then forestall any thing he had to say.

Mr. JOHN BETHELL, being called upon by the Chairman, said he did not feel himself competent to say much upon this point, because the paper was chiefly directed to locomotive engines, of which he had had little or no experience. He might, however, make an observation with reference to the general question as to the comparative merits of coal and coke. He confessed he did not think the paper had sufficiently entered into it. Some years ago it was stated at the scientific institutions, that the coke made from a certain quantity of coal would give the same amount of heat, and evaporate just as much water, as the coal from which it was made. He believed that was a theory which was advocated in that room some years ago, by his friend, Mr. George Lowe. He (Mr. Bethell) confessed he was astonished at that theory, for when they observed the great heat that was generated in converting coal into coke, it seemed very remarkable that the coke should, after being subjected to that process, give as much heat as the coal itself. He had burned many thousand tons of fuel in the stationary engines of his manufactories, and after some consideration of the subject it was clear to him that the difference arose entirely in the mode of burning the fuel. It was possible, no doubt, to construct a furnace which would give coal no advantage over coke. The real point was, the proper construction of the furnace. It was excessively simple to burn coke when operated upon by a strong draft, so as to get all the heat out of the carbon which it contained; but it was not so simple to burn coal, because this involved two operations; they had to burn the gases, which required one mode of treatment, and the carbon, or coke, which required another mode of treatment. He confessed he had not yet seen any plan which, in his opinion, was perfect for carrying out his ideas of burning all the gas and all the carbon. The plan laid before them that evening appeared to him very complicated. In France and Belgium, where they burnt a great deal of coal, as well as a patented fuel which contained more gas than coal, they had a simple apparatus for doing it, and they carried out the process in the locomotive engines without producing so much smoke

as he had met with on railways in this country. He would not then describe it in detail, but it was a simple arrangement of the fire-box, which allowed air to pass in over the fire. He had hoped the paper would have gone more into the general question, and not have been confined to one description of locomotive. There were many locomotives as well as fixed boilers working in this country, in which various plans were adopted, by which the gas from coal was more or less burnt, though not always efficiently. With regard to the analyses before them, he confessed he was astonished at them, and he could hardly believe them to be correct. It was easy to take an analysis of the composition of coal, but the ascertaining how much water a certain fuel would evaporate was a different matter, as apparatus specially adapted to the different kinds of fuel was necessary in order to obtain reliable results. If they were using an apparatus to burn coal which contained the gases as well as the carbon, they must have an apparatus in which the air came over the fire, and if the same apparatus was used for burning coke it would not answer. Hence they found it stated in the table before them that 1 lb. of Ramsay's coal evaporated 15 lbs. of water, whereas 1 lb. of coke evaporated only 12 lbs. of water. He believed if the coke were used with a proper apparatus it would evaporate more. Again, they found it stated that the Merthyr coal, which contained 89 per cent. of carbon and 4 per cent. of hydrogen, or 93 per cent. of heat-giving properties, evaporated only 14 lbs. of water per pound of coal, whilst Ramsay's coal, which contained only 90 per cent. of heat-giving properties, evaporated 15 lbs. of water. That, to a theoretical man, seemed an absurdity, and showed that in all experiments as to using fuel for the evaporation of water, everything depended upon the manner in which the fuel was used. The Welsh coal owners had, for a long time, contended that their coal would evaporate a larger quantity of water than the Newcastle coal; latterly, however, the Newcastle gentlemen had asserted that their coal would evaporate more water than the Welsh coal; but, to his mind, such statements ought to have no weight unless each description of coal was used with an apparatus especially suited for it. Then came the question, whether the apparatus which was suitable for any particular description of coal could be practically adapted for general use with steam boilers. That was a matter which they all knew to be one of considerable difficulty. They could easily construct a small experimental apparatus, but they might not be able to apply it when coal was burnt in masses for heating large boilers. He did not think the meeting was in a condition to argue this question upon the data given in the paper before them, or to enter into it in a way that its great importance deserved.

Mr. George Lowe, F.R.S., said, although he was not a locomotive engineer, yet he had been connected with the combustion of coal and coke in London for the last thirty years. He agreed with Mr. Bethell that there were anomalies in the tables before them, which were most perplexing. Some of those anomalies had been already referred to, and in one instance it was evident that there was some

mistake, viz: in the statement that there was more sulphur in coke after it had undergone the carbonizing process than in the coal itself. As gas men they knew that when the gas was evolved from the coal a certain amount of lime was wanted to get rid of the sulphur which came out of the coal during the process; and therefore he thought there must be some error in the analyses before them. The point, however, to which he most desired to address himself was with reference to a statement which Mr. Bethell had noticed as having been made by him (Mr. Lowe) on the occasion of the reading of a paper upon this subject by Mr. Apsley Pellatt when he had the honor of occupying the chair. On that occasion he begged to state he gave the general opinions of the books—of the schools—rather than his own. They all looked up to Mr. Apsley Pellatt as a tolerably good chemist and a close reasoner, and that gentleman's experiments upon the relative value of coal and coke for the purposes of his immense manufactory had been of the most beautiful and satisfactory kind. Mr. Apsley Pellatt would work one week or a fortnight with coal and the next with coke made from the same amount of coal, and he had shown that in every instance the work in his manufactory was done as well with the coke produced from a ton of coal as with the coal itself. There were eminent French chemists who confirmed Mr. Pellatt's views, which were further confirmed by some experiments made at Philadelphia; and it was to be remarked that whilst Mr. Apsley Pellatt was working upon a large scale, the French chemists on small scale in a laboratory, and the Americans on another scale, and he (Mr. Lowe) was also making his own experiments, the results of all these trials seemed entirely to coincide. He would now say a word or two upon the best mode of conducting the combustion both of coal and coke. The English locomotive had done great credit to the skill of our engineers, as was proved by the fact that as much as 10 lbs. of water was evaporated with 1 lb. of coal; and there was every hope that much higher results would eventually be obtained. Some of the experiments recorded by Mr. Fothergill were made as far back as 1855; but the French engineers, during the last two years, had made immense progress in the successful introduction of coal into the locomotive engine. After all, the great thing was how to conduct the combustion so as to make use of all the heat-giving properties contained in 1 lb. of coal. Mr. Bethell had, no doubt, hit the point in stating, that it was absolutely necessary that a certain amount of air should go over the fire, as well as through the furnace, to produce the proper combustion of coal. Very little air was wanted to go over the furnace if they used coke, but if they used coal, then a certain amount of atmospheric air must go over the furnace so as to combine with, and promote the combustion of, the hydro-carbons and other imflammable matters, which, if they got so far as the chimney, went off in smoke and were lost. The great object was to prevent smoke and produce heat. Many years ago his (Mr. Lowe's) father conducted one of the largest malting establishments in the country, and the whole of the heat in the kilns was produced by the bituminous coal of Derbyshire. All the products of combustion went through the kiln, and if any

smoke had been produced, five minutes would have sufficed to destroy a very large quantity of malt. For the last thirty-five years there had not been a furnace erected by him, in any part of the world, from Lima to Calcutta, in which the principle of letting a certain amount of atmospheric air pass over the surface had not been adopted. Mr. Lowe directed attention to a model of a furnace designed by him, in 1828, which had remained in Berlin for many years, and in which this principle was shown. He concluded by expressing a hope that Mr. Fothergill would, at some future time, favor them with a further paper upon this important subject.

Professor JOHN WILSON, F.R.S.E., would refer to the comments of Mr. Bethell, in which that gentleman challenged the correctness of the analyses given in Mr. Fothergill's tables. He apprehended that Mr. Bethell imagined these to be practical results, but he (Professor Wilson) believed them to be merely theoretical calculations, based upon the possible evaporating power of coal depending on the quantity of carbon and hydrogen it contained. In No. 1 of the tables, the amount of carbon and hydrogen contained in the coal was 90 per cent., and in No. 3 the amount of those elements was 93 per cent., and yet the combustion of the latter gave a smaller amount of evaporating power than the lesser proportion of carbon and hydrogen in No. 1. If Mr. Bethell would bear in mind the vast difference between the power of hydrogen and the power of carbon to generate heat, he would readily be able to reconcile the difference in the results obtained in the two cases, which depended on the atomic proportions in which these two substances combined with oxygen. He thought, therefore, the surplus of carbon in the second case would be more than sufficient to account for the difference between the quantity of water evaporated by the two qualities of coal respectively. This brought him to a point mentioned in Mr. Clarke's letter, in which that gentleman spoke of the difference between coal which was suitable for locomotive engines and that from which coke was made. He stated that the bituminous coals were not those best suited for these engines. If his (Professor Wilson's) idea was right, as to the value of fuel depending upon the amount of hydro-carbons it contained, then the more highly bituminous the coal was the greater would be its evaporative power. Therefore, if they burnt coal they ought to get that which contained the largest amount of bituminous matter, in preference to that from Wales known as steam coal. Having defended Mr. Fothergill's analyses so far, he would now begin to challenge them himself. There was one point which struck him as rather curious. He could reconcile the difference in the relative quantities of sulphur in coal and coke, for when, as had been stated, it took $1\frac{1}{2}$ tons of coal to make a ton of coke, it was possible that an extra amount of sulphur might exist in the coke; but he could not understand how coal containing 2 per cent. of ash, could be converted into coke containing 7 per cent. of ash when only $1\frac{1}{2}$ parts of coal went to make one part of coke. He took great interest in the question of the introduction of coal into the locomotive engine, and he should hail any contri-

vance that would enable the locomotive to consume coal with the same amount of comfort to the public as they now had with coke.

Mr. BETHELL thought he might have been misunderstood in his remarks in reference to the experiments on the relative heating powers of coal and coke. The point he desired to lay stress upon was, that he could not understand and he could not believe, that if proper apparatus had been used for burning the coke, the evaporative power would have been so small in comparison with that produced by coal.

Mr. CHARLES GREAVES, on being called upon by the Chairman, said he did not feel himself to be well informed upon the bearing of this question as to locomotives, and the paper being specially applied to locomotives, it was only in reference to the burning of fuel in that manner that it was open to much criticism. For his own part, in comparing the efficiency of coal and coke in stationary boilers, and with every contrivance for husbanding the heat, he had found coke had produced greater efficiency than coal. He had tried every method for raising coal to the full efficiency of coke by weight, but he had not been able to do so by any process for the admission of atmospheric air. He had taken part in the discussion of Mr. Apsley Pellatt's previous paper about two years ago, and his further experience confirmed the opinion he then expressed, that the superiority of coke over coal by weight was from 12 to 14 per cent. In point of price, however, coke in London was 60 per cent. dearer than coal; there was, therefore, room for a considerable superiority in efficiency by weight of coke over coal, while still leaving a large economy in money in favor of the latter. There was one point about which he should like to hear a little more, that was as to the theory of the coke cutting the tubes of the boiler, for if that were the case what became of the coke? Did it go up the chimney and blow away as solid coke? This point had yet to be determined.

After some remarks from Mr. DUNCAN in reference to the analyses given in the paper,

Mr. FOTHERGILL, in reply upon the discussion, said he had been entirely misapprehended by one or two gentlemen in reference to the analyses he had given. These analyses had been made in the laboratory of Mr. Dugald Campbell, and were not the result of actual experiment from the use of fuel in a locomotive engine. With regard to the statement of one or two of his friends that he had not brought the general subject fully before the meeting, he begged to state that these gentlemen had overlooked the object of this paper, which he had brought before the Society in fulfilment of a pledge he had given to communicate the results of experiments in which he was engaged as to the comparative merits of coal and coke as applied to the engine which was the invention of Mr. Beattie. That being the case, it would have been, he considered, quite out of place to have introduced more modern experiments, in order to confirm the results obtained at that period. With regard to the question of heating the feed-water referred to by Mr. Clarke in his letter, he would state that when experiments were first made with Mr. Beattie's engine that contrivance was not

appended to it. The apparatus then used did not enable them to feed the boiler with hot water at starting, but as they proceeded on the journey the temperature of the water became higher; but in the modern contrivance they could commence the journey with the feed-water at a high temperature. With regard to the relative quantities of the fuel, he had stated that 1½ tons of coal had been used to produce 1 ton of coke; in some instances the quantity had been 1¾ tons of coal to produce 1 ton of coke; but, in order that there might be no misunderstanding upon that point, he had put the calculation into the money shape, and he had stated what the result was without taking into consideration how much coal it required to produce a ton of coke, but had at once given the cost of working the train, which he thought was the legitimate question to which they should turn their attention. He took the coal furnished at a given price, and also the coke, and then instituted a comparison between the two, not troubling himself about the different classes of coal and coke. He had conducted experiments for the Lancashire and Yorkshire, and the East Lancashire Railway Companies, but there was not time to apply the contrivance for heating the feed-water. With regard to the blast-pipe in Mr. Beattie's engines, they had to increase the amount of air to soften the blast, for if they had a powerful blast, they then got an over-heated smoke-box. He never knew an instance of that upon the South Western line but once, which was during a heavy wind, when they had a powerful blast, and the whole of the steam was used in passing up the chimney. The remainder of the questions discussed he believed had been satisfactorily answered in the paper itself, and he begged to thank the meeting for the attention with which they had listened to him.

The CHAIRMAN said they had heard a most interesting paper, and discussion upon it. After all that had been said on either side, they must come to the practical question—whether the use of coal or coke was the most economical, as well as the best mode of working a locomotive. He had not gathered that the accuracy of Mr. Fothergill's tables, in respect of the comparative economy of the two systems, had been impugned. Experiments with the engines at the same speed, and for the same distances, had been tried, and the result was as Mr. Fothergill had stated; and unless any one was prepared to impugn that statement, the case must be considered as so far made out. Mr. D. K. Clarke had made a most important statement. He had said that, supposing Mr. Fothergill's experiments to have been clearly made out, there would be a saving of 1 per cent. upon the aggregate railway dividends throughout the country, or no less than £300,000 per annum upon the railway capital of 300 millions. He thought the meeting was very much indebted to Mr. Fothergill for his simple, clear, and able statement of a very difficult and interesting question, and he hoped at some future period that gentleman would be induced to give them some further information upon the subject. He was sure the Society would unanimously pass a vote of thanks to Mr. Fothergill for his very interesting paper.

AMERICAN PATENTS.

List of American Patents which issued from July 12, to August 9, 1859, (inclusive,) with Exemplifications.

JULY 12.

102. Mode of Staving Piles for Wharves, Piers, &c.; E. H. Angamar, New Orleans, Louisiana.

Claim—In combination with the piles, the frames, the sleeves, and the braces, arranged as set forth.

103. Locks; S. T. Bacon, Boston, Massachusetts.

Claim—The construction of one or more pistons or drivers, or both; also, one or more holes in the rotating tumbler or surrounding cylinder, or both, as specified.

104. Bank and Safe Locks; S. T. Bacon, Boston, Massachusetts.

Claim—1st, Arresting and holding the tumbler in an exact locked position. 2d, Preventing the displacement of the tumbler in the direction of unlocking by means of pins, in combination with the sliding bottom key-hole guard and the tenons. 3d, Preventing the displacement of the tumbler at and beyond the locked position, by means of the slotted collar, in combination with the cylinder, the tumbler, and the tumbler pin. 4th, Preventing the displacement of the tumbler inwardly, by means of the collar, in combination with the cylinder and the bolt of the lock. 5th, Enlarging the piston holes throughout the lock. 6th, Enlarging the holes in both tumbler and cylinder, in each direction from the dividing line between them. 7th, Constructing the key-hole guard of two or more pieces of metal hardened. 8th, Making one or more chambers between the several parts of the key-hole guard. 9th, Dividing the air chamber or chambers with one or more narrow ridges.

105. Lamps; Joseph M. Batchelor, Foxcroft, Maine.

Claim—The arrangement and combination of an adjustable tube with the wick, button spindle, spur wheels, and friction spring, or the equivalents thereof.

[The stem of the button spindle has arranged on it in connexion with the small spur wheel usually employed for raising the wick, a larger spur wheel gearing into a rack projecting from the side of the wick tube, so that the wick and tube can both be raised or lowered by turning the bottom spindle in exact relative distances to produce the proper amount of light required.]

106. Devices for Training Pea Vines; John T. Bever, Haynesville, Missouri.

Claim—The posts, when forming a box, as described, and combined with cords, rope, and pegs.

107. Railroad Chairs; D. E. Bishop, City of New York.

Claim—The formation of a bridle in the centre of the continuous lift of a railroad chair, as described.

108. Grain Separators; J. L. Booth, Cuyahoga Falls, Ohio.

Claim—The box, provided with an inclined bottom or flooring and adjustable strips or valves, arranged to operate as set forth.

[This invention relates to an auxiliary device to be applied to grain separators that separate grain by projecting it against the air, and is more especially designed to be used in connexion with a grain separator that was patented by this inventor, March 8, 1859. In this machine the sound grain is separated from the light and inferior grain, in consequence of projecting it by certain mechanism forcibly against the air; the sound grain, by its superior gravity, being projected further than the light. The object of the present invention is to receive the grain, both the sound and light portions, as it is projected from the machine, and to more fully separate and to collect it into distinct parts, and to graduate the separation as may be required.]

109. Rat-traps; J. Borton, Middlebourne, Ohio.

Claim—The combination of the spring doors, rods, o o, dog, d, and rod, r, arranged in the manner set forth.

110. Combination of Flesh Fork and Skimmer; Charles B. Bristol, Nagatuck, Connecticut.

Claim—The combination of the fork and skimmer, constructed as described.

111. Mode of Operating Farm Gates; J. H. Butler and P. G. Van Houten, Cohocton, New York.

Claim—Actuating the traps by means of the weight and cord, arranged in combination with the lever, or its equivalent, for operating automatic gates, in the manner described. Also, the construction and operation of the double-acting latch, in combination with an automatic gate for carriages.

112. Walking Canes; Ansel Cain, Holyoke, Massachusetts.

Claim—The combination of the lamp, arranged in the manner described, with the walking cane.

113. Hanging the Bodies of Vehicles; J. H. Case, Lyons, New York.

Claim—The combination of the metallic springs with thorough braces, in the manner set forth. Also, the combination and arrangement of the combined thorough braces with the circular body and supplementary spring, as described.

114. Skirt Supporters; Matthew Chambers, City of New York.

Claim—Combining with and securing to a corset band extending in the rear, or in the rear and front downwards from the waist, to clasp the body around the hips of the wearer, the framework of a skirt or bustle, when said frame-work is composed of hoops disconnected and fastened in front, or thereabouts, as described.

115. Mode of Telegraphing from Railroad Cars while Moving; Denison Chesebro, Syracuse, New York.

Claim—The combination of a sufficient number of pendants, arranged as described, and each having a movable vertical tongue, and so constructed as to admit of a telegraph wire being attached to each of them in the particular manner specified, with the metallic plates, wood scantling, or equivalent, and conducting internal wires, attached to the roof of a railroad car.

116. Device for Fastening Cutters of Hollow Augers; Wm. A. Clark, Bethany, Connecticut.

Claim—The angle wedge, in combination with the cutters, face plate, screws, and ledges, as described.

117. Fruit Basket; David Cook, New Haven, Connecticut.

Claim—Making a metal bound wooden fruit basket, either plain or ornamental, when constructed and fitted for use, as described.

118. Connecting the Ends of Railway Bars; John Davis, New Bedford, Massachusetts.

Claim—1st, Connecting the rails of railroads in continuous chains with hinge joints, in any practical mode. 2d, Securing the rails in the couplings, by inserting wedges longitudinally under the rails, and clinching their margins. 3d, Wedge, D2, to secure wedge, D3, and vice versa, by means of the hinge joint or bolt.

119. Wheels of Buggy Boats; Perry Davis, Providence, Rhode Island.

Claim—Arranging paddles upon the spokes of the wheels of a buggy boat, so that the wheels perform the two-fold purpose of paddle-wheels and carriage wheels, in the manner set forth.

120. Revolving Fire Arms; W. C. Ellis and J. N. White, Springfield, Massachusetts.

Claim—The projection at the bottom of the chambers of the cylinders, on which the fulminate of the cartridge rests, and is struck by the hammer in the discharge. Also, the flanch of the cartridge parallel with the barrel, the two in combination, for the purpose specified.

121. Apparatus for Tanning; L. C. England, Oswego, New York.

Claim—In combination with the leach-vat and the conveyer trough, the pair of rollers to crack the wet bark before it is delivered into the leach vat.

122. Fireman's Ladder; Daniel Fitzgerald, City of New York.

Claim—1st, Suspending a ladder upon a standard, so that it may be elevated and turned in any direction. 2d, The arrangement of the branch pipes with the stop-cocks for use at various heights. 3d, Making the main pipe serve as a hand-rail to the ladder, and to give it stiffness, by setting it up a little above and parallel to it, as described.

123. Method of Hanging Pictures, Looking-glasses, &c.; W. A. Foster, Chester, Connecticut.

Claim—Adjusting picture frames or mirrors to different positions and at different angles, by means of a central hinge and levers, as described.

124. Breech-loading Fire Arms; M. J. Gallagher and Wm. H. Gladding, Savannah, Georgia.

Claim—Forming the chamber in the barrel and breech of the gun of the shape of two frustrums of cones, or of a frustrum of a cone, and a section of a parabolic spindle, whose bases meet at or near the line of the joint between said barrel and breech, for the purpose of containing a cartridge case of the form as represented.

125. Clothes Frame; Joseph Gasser, Toledo, Ohio.

Claim—The arrangement of the braces and arms in connexion with the standard and legs, as set forth.

126. Dumping Car; David Glover, Cass Township, Pennsylvania.

Claim—The construction of a revolving tip placed upon a movable frame or truck, the side pieces of which form, at a certain stage of the operation, a continuation of the main track or foundation, by means of which the wagon or car can be taken, without handling, from the main track or foundation, with the load moved to the place required, and there dumped in any direction.

127. Shingle Machine; Freeman Godfrey, Grand Rapids, Michigan.

Claim—The cams, gearing into rack bars attached one to each end of the carriage, said cams being fitted in a yielding or adjustable centre-poised frame, and operated from the power lever, through the medium of the pawl, ratchet, and gearing.

128. Machine for Making Paper Bags; Wm. Goodale, Clinton, Massachusetts.

Claim—1st, Making the cutter which cuts the paper from the roll or piece of the form herein described, that, in cutting off the paper, it also cuts it to the required form to fold into a bag without further cutting out. 2d, The attachment of the former directly to the cutter to operate in combination therewith, and with a folding table. 3d, The described mode of applying and arranging the paster, to operate in combination with the folding table and the former. 4th, The construction of the side lappers with angular ends, for the purpose of partly folding the sides of the bag. 5th, The knock-off, operating in combination with the former. 6th, The vibrating frame with its rollers, operating in combination with the former and the knock-off, as described. 7th, The arrangement of the table, the cutter, the former, the side lappers, the bottom paster, the knock-off, and the vibrating frame, to operate in relation to and in combination with each other.

129. Machine for Splitting Fire-wood; Darwin A. Green, City of New York, Administrator of Elias Davis, deceased.

Claim—The slabbing knife and splitting knives secured to one cross-head, acting simultaneously at the forward movement of the latter, as described.

130. Dry Gas Metres; Tobias Grodjinski, City of New York.

Claim—Attaching each pair of the plates, or their equivalents, to the flexible part of the diaphragms of dry gas metres, by overlapping parts of the one upon the other, in the manner set forth.

131. Sewing Machines; George Hensel, City of New York.

Claim—The construction of the disc with an elastic plate attached, and operated by means of a cam, in the manner set forth.

132. Stoves; S. Emilius Hewes, Albany, New York.

Claim—A revolving fire-pot, arranged to traverse perpendicularly or to be raised and lowered, as described, for the purpose of supplying air to, and shutting it from, the openings in the sides of the fire-pot, so as to effect a ready and perfect combustion and consumption of the fuel.

133. Clothes Frame; H. J. Holmes, Warren, Massachusetts.

Claim—A series of vertical frames, one of which has permanently affixed to it a foot-piece and cap, when said cap and foot piece forms suitable bearings for other frames, arranged as set forth.

134. Water-wheels; John P. Hughes, Spout Spring, Virginia.

Claim—Making the water arms in sections, essentially as described.

135. Dumping Wagon; Anthony Iske, Lancaster, Pennsylvania.

Claim—The drop-door with its lever, the partitioned box with its rack bar on the bottom, the handled spindle for moving the same, as specified.

136. MACHINES FOR DRESSING MILL-STONES; John W. Kennedy and John F. Plummer, Plainfield, Connecticut.

Claim—The arrangement and combination of the arbor, forked arm, spring, shaft, U, ratchet and pawl, wiper, bar, movable case, shaft, K, and adjustable plate, as described.

137. HEAD-BLOCK FOR SAW-MILLS; J. Kurtzeman, Lancaster, Pennsylvania.

Claim—The sliding rack bar placed longitudinally in the carriage, and adjusted therein by the wedges in connexion with the gearing, whereby the two sides may, by a suitable adjustment of the wedges, be actuated both simultaneously and separately, as may be desired.

138. METHOD OF CONSTRUCTING MALLETS; Wm. Lance, Olney, Illinois.

Claim—The manner of their construction and arrangement, as described.

139. BEE-HIVES; John K. Leedy, Woodstock, Virginia.

Claim—1st, The boxes, constructed and arranged in the manner specified. 2d, In combination with the boxes, the pipes, and their faucets, all arranged in the manner set forth.

140. SALIMOMETER; Robert H. Long, Philadelphia, Pennsylvania.

Claim—The means of drawing into a vessel water from a steam boiler as a means to facilitate testing the density of the water in the same, constructed and arranged as set forth.

141. LIFE-PRESERVING RAFT; A. G. Mack, Rochester, New York.

Claim—Surrounding a cask or chamber with conical floats arranged radially with said chamber and hinged thereto, and covering the cone with canvass, or other suitable material, and bracing the whole together by a rope, suitably arranged.

142. PAINT CANS, &c.; John Masury, Brooklyn, New York.

Claim—The construction of a metallic can for hermetically sealing paints and other substances, having attached thereto a rim or ring of thin brass, or other soft metal, in such a manner that the top or cover may be removed by severing the said rim or ring of brass, or other soft metal, with a penknife or other sharp instrument, in the manner described.

143. EARTH-BORING AUGERS; A. A. McMahen, Oxford, Mississippi.

Claim—Bracing the two ends of the spiral portion of the auger by means of the central rod, in the manner described. Also, the manner of securing the boring tools and rod to the spiral, by which they may be removed and replaced without making any changes on the spiral, in the manner described.

144. DREDGING MACHINE; Anton Menge, Point a la Hache, Louisiana.

Claim—1st, The bucket frame, when resting upon adjustable casters or friction rollers, and operated so as to be swung from right to left of the boat upon a circular track, in combination with the oscillating shaft, all arranged in the manner set forth. 2d, The buckets having a hinged back, arranged as specified.

145. PRESERVE CANS; F. O. More, Bellefontaine, Ohio.

Claim—The peculiarly formed cap, in combination with the curved spring lip.

146. PORTABLE OVEN; Z. N. Morrel, Cameron, Texas.

Claim—Forming the pin on the handle on the cover of a Dutch oven or skillet, in combination with the tube under the centre of the frying-pan or gridiron.

147. DYNAMOMETER; Charles Neer, Albany, New York.

Claim—The combination of the rigid arm or arms and yielding incline or inclines with the loose pulley, or its equivalent, whereby the power exerted to rotate the shaft is denoted by the motion resulting from the pressure against said yielding incline or inclines, for the purpose of forming a rotary dynamometer. Also, the revolving and sliding cone adjusted in its position according to the power applied from the pulley to the shaft, when combined with a registering apparatus to record the amount of power made use of.

148. WASHING MACHINE; Charity Pendleton, Galena, Illinois.

Claim—1st, The combination of the two horizontal bars or rails, J and M, having a circular reciprocating motion, with the fixed corrugated cylinder surface forming the bottom of the machine, and having its axis coincident with the axis of motion of the said bars, the parts being constructed and arranged as described. 2d, The combination of the slot or mouth in the arm, and the tenon at the ends of the corrugated rubbing bar, M, with the perforated bar, J, by which the portion of the said corrugated rubbing bar, M, may be altered with respect to the bottom of the machine, so as to increase or diminish its distance therefrom, and without altering the position of the bar, J. 3d, The combination of the corrugations on the lower surface of the rubbing bar, M, with similar corrugations on the bottom or concave of the machine, but so arranged that the direction of the two sets of corrugations will be at right angles to each other.

149. METHOD OF OPERATING WINDLASSES WHEN APPLIED TO HAY-PRESSES, &c.; Peter Philip, Ghent, New York.

Claim—1st, Attaching the wheel or table to the capstan, so as to be operated upon by the loose or boom-sweep as a brake, for the purpose of stopping the press at any point of descent, while being filled, and of regulating and controlling the motion of the capstan in the uncoil. 2d, Providing the capstan with the arms and the loose or boom-sweep, in combination with the check lever, in the manner and for the purpose set forth.

150. MACHINE FOR BORING HUBS; Daniel Quimby, Littleton, New Hampshire.

Claim—The shaft, the boss placed on said shaft and provided with a conical bore, and having the collar and arms attached, the screw rod connected with the collar by the gearing, and providing with the divided nut attached to the upright, arranged as set forth. Also, in combination with the parts above named, the convex projection placed on the shaft, to operate as specified.

151. POCKET REGISTER OF COUNT; P. D. Richards and F. N. Thayer, New Orleans, Louisiana.

Claim—The construction and arrangement of a hand-operating talley, consisting of three indexes and corresponding wheels to indicate count, as specified, the whole being operated by a projecting stud and spring brake with its gauge.

152. PEN AND PENCIL CASES; John Richardson, City of New York.

Claim—The arrangement of the spiral grooved sleeves and their connexion with the pen-holder and pencil, and also with the outer shell of the case, as described.

153. HYDROSTATIC LIFTING JACK; John Robertson, Brooklyn, New York.

Claim—The employment of the exterior movable hydraulic cylinder with toe-piece upon its surface, in combination with the standard, which serves also as piston and eduction pipe, as described.

154. SELF-DETACHING WHIFFLE-TREES; Wm. G. Russell, Winchester, Virginia.

Claim—A swingle or whiffle-tree provided with a lever turn bar, together with the spring clasp and the hinged or jointed hooking ferules, arranged as set forth.

155. COAL SIEVES; Silas T. Savage, Albany, New York.

Claim—The employment of the two half-globes, in which there are interstices, as a coal sifter, when said half-globes are provided with grooves, tongues, and shoulders, the same being used in connexion with a box or cylinder, by means of which the two portions of the globe are prevented from moving endwise of the trunnions and are prevented from separating.

156. SAWING MACHINE; T. W. Schmidt, Philadelphia, Pennsylvania.

Claim—The combined arrangement of the stationary frame fitted with the adjustable holders and the saw carriage operated by the crank, shaft, f, spur wheels, shaft, m, and rope or chain, whilst the saw is at the same time rotated through the media of the gear-wheel, pulley, and band, the said stationary frame and the said moving saw carriage, operating together as described.

157. MACHINE FOR MAKING HAND-RAILS FOR STAIRS; Cornelius R. Shaeffer, Gettysburgh, Pennsylvania.

Claim—The combination of the perpendicular square post erected upon the base with the draft-board, pitch-boards, rod, and arm, arranged as set forth.

158. CONFECTIONERY SAFE; Reuben Shaler, New Haven, Connecticut.

Claim—The confectionery safe, constructed substantially as specified.

159. CORN HUSKERS; George F. Shaw, Woburn, Massachusetts.

Claim—The combination and arrangement of the cylinder and concave roller, as described.

160. REFINING IRON; Christian Shunk, Canton, Ohio.

Claim—The use of the external crucible or hearth having the tweer pipe, the projecting stone, and the escape pipe, operating in such a manner that the blast shall deflect from the side of the upright stone and produce a rotary movement in the melted metal for the purpose of refining the same, as specified.

161. THRESHING MACHINES; Joseph Siddall, Philadelphia, Pennsylvania.

Claim—The combination of flails, roller, slides, and straps, when said flails are constructed with the flexible joints, the arrangement and operation being as set forth.

162. LOCK FOR FIRE ARMS; Michael Tromly, Mount Vernon, Indiana.

Claim—1st, The combination of the hooks, or their equivalents, respectively formed on the claw of the link and the trigger, as described. 2d, Widening the upper end of the trigger so as to form a projection in front, whose lower curved edge shall operate on the curved surface of the claw, in the manner set forth.

163. ARTIFICIAL STONE; J. L. G. Ward, Adrian, Michigan.

Claim—A cement composed of pumice-stone, silicate of soda, fluor spar, and Roman cement, as set forth.

164. PRESERVE CANS; Oliver N. Weaver, Dover, Kentucky.

Claim—The perforated elastic plug secured in the top of a provision can, with a nozzle and tube communicating with an exhausting chamber, as set forth.

165. TRAP FOR ANIMALS; Loren Wetmore, Tioga County, Pennsylvania.

Claim—1st, The peculiar construction and arrangement of the manifold trap, as set forth. 2d, The arrangement of the trip provided with a fulcrum or fulcra, guide pin, and arched wire, for operating the trap, as set forth.

166. ATTACHING THE HEADS OF METALLIC POWDER-KEGS, &c.; James Wilson, Charles Green, and Wm. Wilson, Jr., Wilmington, Delaware.

Claim—The double seaming of both heads of the keg and the opening in one head, in the manner described.

167. HOLLOW AUGER; Arcalous Wyckoff, Elmira, New York.

Claim—Combining the transverse auxiliary cutters with the prime cutters and elliptic opening of the annular cutter head, as described.

168. BREECH-LOADING FIRE ARMS; Peter Altmair, Assignor to self and Myron M. Faxon, Lewiston, Penna.

Claim—In combination with a fixed breech-piece, a hinged barrel, so arranged as that the said barrel shall swing upward and expose the chamber of the breech-piece, below the rear end of the barrel, for inserting the charge, as described.

169. MONEY-DRAWER ALARM; R. M. Campbell, East Cambridge, Assignor to self and Benjamin S. Wright, Boston, Massachusetts.

Claim—The combination and arrangement of the two levers and the spring latch with the clock-alarm apparatus, the striker, and bell, and the combination of the same and a series of perforated key slides and a set of T-bars applied together and to such levers so as to actuate the same. Also, the combination and arrangement of the T-bars and the perforated key slides, to operate in manner described. Also, in combination with the key-lock and the T-bar, I, a latching apparatus placed in the case, and constructed so as to lock both the cover and the T-bar, or either, as specified. Also, the combination of the detector or indicator with the case cover and the T-bar, H, and operated in manner specified.

170. SAFETY APPARATUS FOR CITY RAILROAD CARS; Samuel Green, Lambertsville, New Jersey, Assignor to self and W. R. Green, Philadelphia, Pennsylvania.

Claim—The swinging frame in connexion with the bolt and the cover, the brake blocks in connexion with the chains and rods, and the stationary supporting piece, or their equivalents, arranged in the manner described.

171. CLASPS FOR SKIRT HOOPS; Samuel B. Guernsey, Waterbury, Connecticut, Assignor to W. H. Reed and G. W. Zeigler, City of New York.

Claim—Connecting the hoops with the straps, or equivalents thereof, for connecting and suspending them by means of plates bent to embrace the hoops, and formed with two slots or apertures, through which the straps, or equivalents, pass, thus clasping the straps, or equivalents, to the hoops, as described. Also, the employment of the metal clasps, constructed as above described, in combination with and as a means of connecting the ends of the hoops, as described.

172. Cattle Gates for Railroads; Moses Hall, Jr., Assignor to self and S. H. Judy, Osborn, Ohio.

Claim—Constructing a cable guard or gate with its cross-bar or shaft below the rail of the railroad track, and operated by springs, as described.

173. Apparatus for Packing Fruit; Robert Law, Lockport, Assignor to self and P. T. Dix, Olcott, N. Y.

Claim—The V-shaped or wedge-acting yoke provided with fulcrum pins, and the hooked recesses in the upper ends of the bent clamping levers arranged and acting in combination with the screw, fulcrum link, and claws, or their equivalents, in the manner specified.

174. Sewing Machines; Sidney Parker, Assignor to self and Hugh Herringshaw, City of New York.

Claim—The combination of the hook and the feeding arc, in the manner set forth. Also, the method of adjusting the feed, by means of the combination of the spring piece and the feeding arc, in the manner described.

175. Sugar Mills; John Paynter, Assignor to self and John McCorkle, Shelbyville, Indiana.

Claim—The combination and arrangement of the journal, wheel, gearing, and rollers, the whole being suspended in a frame, and constructed as described.

176. Winding Skeins of Thread; Asa T. Ring, Newton, Assignor to N. T. Spear, Boston, and A. J. Robinson, Milton, Massachusetts.

Claim—The combination of the clamping spring, screw, and guide pin or rod, with the tightening and supporting shank and bobbin, arranged as specified.

JULY 19.

177. Washing Machine; Lewis Allen, Sleepy Creek, Virginia.

Claim—The construction of the open hollow washing, rinsing, and dipping cylinder, composed of a series of bars placed at regular intervals from each other, and provided with an open net-work. Also, in combination therewith, the fluted or ridged pressure, squeezing cylinder, and detachable framing, arranged in the manner described.

178. Variable Exhaust Device for Steam Engines; Jacob Barney, Chicago, Illinois.

Claim—1st, The employment of two cylinders so provided with gradually tapering grooves in each, that when revolved together, an expanding and contracting circular opening will be formed for the purpose of regulating the passage of the exhaust steam from locomotive and other engines. 2d. The cylinder, as constructed, when used in combination, the tight metallic case and packing, arranged in the manner set forth.

179. Universal Joints; James Baylor, Canton, Illinois.

Claim—Connecting shafts, when placed angularly with each other, by means of the universal joints, constructed as described, by which a rotary motion may be transmitted from one shaft to the other.

[This invention consists in the employment of a cylindrical coupling box, having two slotted bars pivoted within and at either end of the box, at right angles to each other, to the centres of which the ends of the shafts are pivoted, so that a rotary motion can be conveyed from one shaft to the other when they have a considerable inclination, thereby dispensing with the beveled wheels commonly employed for this purpose, and obtaining a regularity of motion with very little friction.]

180. Boot-trees; W. H. Bettes and I. H. Parker, Kokomo, Indiana.

Claim—1st, The employment of the sleeve in connexion with the screw shaft, the two being arranged as set forth. 2d, The arrangement of the cords with the levers, in the manner set forth. 3d, The combination of the instep, side-pieces, and toe-piece, when so arranged that they will operate simultaneously, as described.

181. Bedstead Cord-pin; J. T. Bever, Maineville, Missouri.

Claim—A bedstead cord-pin, consisting of two parts, which are constructed and operated in the manner described.

[The invention consists in forming an eye through the ordinary pin, and having a turning-piece pass through said eye. This piece has a square head to receive a wrench; it also has ratchet teeth formed on it to gear with reverse set ratchet teeth formed in the side of the pin. The bed cord attaches to the inner end of the turning-piece, and consequently when said piece is turned, the cord is twisted and made tight; the ratchet teeth preventing any slipping after the desired tension on the cord is produced.]

182. Sugar-cane Presses; Wm. Bull, New California, Wisconsin.

Claim—The arrangement and combination of the hinged adjustable frame, E, roller, J, frame, A, wedge, inclined spouts, and roller, D, as described.

183. Cotton Gin Sharpener; A. H. Burdine, Chulahoma, Mississippi.

Claim—1st, The combination of two-crossed reciprocating files with a circular feeding disc, which is constructed with an angular recess and an inclined hook at one point of its circumference. 2d, The combination of the above with a jointed slotted frame and a driving cam.

184. Stoves; P. N. Burke, Buffalo, New York.

Claim—The arrangement and combination of the perforated plates, the partition plate, the flue, the fire-guard, hot air-pipe, and chamber.

185. Machines for Planing Metal; Jeremiah Carhart, City of New York.

Claim—1st, The pressure plate or plates, in combination with the reciprocating bed and feeding strip, when said plates extend substantially the length of the blank to be planed, and the bed travels far enough to carry the feeding end of the strip entirely past the facing cutter at each operation. 2d, Rebating the inner edges of the pressure plate or plates in such manner as to furnish at once edge guides and pressure for the blank while being fed to the cutters. 3d, In combination with the pressure plates and cutters, the shields extending downwards from the pressure plates to protect the space between the plates from shavings and other foreign matter. 4th, In combination with the reciprocating bed and feeder, the scraper and brush, acting in combination for cleaning the bed and feeder or feeding strip.

186. Harvesters; Herman Carter, Greene, New York.

Claim—The vibrating discharger, in combination with the rake, arranged in the manner described.

187. Canal-boat Propeller; Robert Cartwright, Ithaca, New York.

Claim—The step or bearing block, arranged relatively to the rudder and vessel to receive the end thrust

of the propeller shaft, and thus relieving the gearing and rudder from pressure, the whole end thrust of the propeller being upon the step-block, which is arranged to admit of any lateral motion to the vessel's centre line, thus forming a steering as well as propelling power, and being all placed externally, it entirely obviates the necessity of entering the vessel below the water line.

188. COFFEE-POTS; William Chesterman, Centralia, Iowa.

Claim—The arrangement and combination of the piston-packed strainer, cylinder, receiving vessel, socket, and condenser, as described.

[By the peculiar arrangement of this coffee-pot, when the water in it is heated, the steam presses up through the strainer containing the ground coffee, and through a quantity of water above the strainer, so that when the pot is taken off the fire, a vacuum is formed in the lower portion of the pot, and the water above the strainer is forced through the ground coffee into the lower portion of the pot, whence it is drawn off by a spout, and the upper portion of the pot is provided with an air-tight vessel, which acts as a condenser for the vapor of the uppermost water, so that no aroma escapes.]

189. VEGETABLE CUTTER; John Clary, Dayton, Ohio.

Claim—The arrangement of the cutting disc suspended from the cross-piece in connexion with the convex cutting edge of the cutters, in the manner set forth.

190. DOUBLE-ACTING PUMPS; William H. Davis, Austin, Indiana.

Claim—The construction and arrangement of the air chamber, side pipe, and cylinders, and flanch at the top, all in one piece of casting, for the purpose of suspending the cylinders sufficiently deep in the well to prevent freezing, in combination with the bottom plate.

191. STOVES; Rufus Dawes and W. C. Choate, Washington City, D. C.

Claim—The combination of a new fire-room for a downward draft, having a lid to close the opening at the top, containing a valve in the lid and an open grate in front, having a door to close this opening air-tight, with a system of ovens heated and ventilated.

192. ROTARY CULTIVATORS; B. F. Field, Sheboygan Falls, Wisconsin.

Claim—The combination of two or more wheels on one crank eccentric, or equivalent axle, when the said wheels are arranged in pairs on the axle, one wheel within the other, and so as that the spades or forks attached to the inner wheels shall pass out and in through the apertures in the outer wheels, for the purpose of displacing and pulverizing the soil over which they pass, in the manner described.

193. STOVES; J. D. Field, Davenport, Iowa.

Claim—The fire-chambers, D I, flue, and water heater, the latter being provided with inclined tubes to form the grate of the fire-chamber, D, the above parts being arranged relatively with each other, the oven, and the smoke-pipe, to operate as set forth.

194. VARIABLE CUT-OFF GEAR WITH STEAM ENGINES; Ambrose Foster and Noah Sutton, City of New York.

Claim—The employment for operating either the main valve or valves of an engine or a separate cut-off valve or valves, of a compound cam, composed of two parts, C and D, constructed and combined with each other and applied to the main or a counter shaft, as described.

195. LOCK FOR SAFES, &c.; August Freutel, City of New York.

Claim—1st, The slotted wheels, m, on the tumbler, l, and the plates, in combination with the wheels, 6, of the knobs, when said wheels, m, are so arranged that the act of unlocking, or attempting to unlock, the bolt moves the wheels, m, away from the wheels, 6, in the manner specified. 2d, In combination with the tumbler, l, carrying the wheels, m, and acting as aforesaid, I claim the cross-piece and tumbler, as set forth.

196. HARVESTERS; C. B. and G. B. Garlinghouse, Allensville, Indiana.

Claim—The peculiar arrangement of the disc in relation to the mechanism for operating the cutters, the standard, and sliding frame, in the manner specified.

197. TRIMMER FOR LAMP WICKS; Halvor Halvorson, Cambridge, Massachusetts.

Claim—In combination with a knife and bed or anvil, or other suitable wick-cutting devices, gauges, arranged as shown, or in such a manner as to hold or retain the wick, and prevent it expanding laterally, while under the action of the cutting device.

198. LATHES; Jacob Hess, Niagara Falls, New York.

Claim—The combination of the grooved central shaft with its movable discs, adjusting gears, and index spring hook, all arranged in relation to each other, as set forth.

199. MACHINES FOR RAKING AND LOADING HAY; Grove Howard, Westfield Township, Ohio.

Claim—The arrangement of the endless belt, pulleys, curved teeth, rods, lever, and catch in the frame, and with the body, constructed and operating as specified.

200. BIT-STOCK AND WRENCH; L. S. Hoyt and B. B. Beers, New Fairfield, Connecticut.

Claim—1st, The wimble or bit-stock wrench with one permanent and one movable jaw, which may be readily adjusted to turn nuts or screws of different sizes. 2d, The block, or its equivalent, with a socket adapted to receive and hold the shanks of common bits and fitted to the permanent or movable jaw, or both, so as to hold the block and bits. 3d, The screw, so arranged as to fasten the block on to the jaw and the bit in the socket at the same time.

201. STEAM COCK; Wm. Johnson and Martin Silmser, Auburn, New York.

Claim—A plug cock, with a sectional plug, whose sides are inclined to its axis, in combination with a single casing through which and directly opposite are openings whose sides are parallel to the axis of the plug, and constructed as described.

202. JOINT FOR PUMP-PIPES; David Knowlton, Camden, Maine.

Claim—Making the joint hemispherical, in combination with the stiff or rigid flanches, by which the parts joined hemispherically may be held at the desired angle.

203. SHIPS' WARPING CHOCK; David Knowlton, Camden, Maine.

Claim—The cast iron warping chock described.

204. HOSE COUPLING; A. H. Lowell, Manchester, New Hampshire.

Claim—The locking devices described, in combination with the screw tube, arranged in connexion with, and on the outside of said locking devices.

205. GRAIN SEPARATORS; Franklin I. May, Beverly, New Jersey.

Claim—1st, The two side or supplementary inclined planes, in combination with the short inclined plane and the two adjustable guides, arranged together so as to operate as described. 2d, The employment of the sliding board in the shaker, when the said board is arranged to operate in combination with the screens therein, for the purpose of better preparing the grain, &c., for the inclined planes and the rotary screen.

206. FOOT-STOVES; James H. Maydole, Eaton, New York.

Claim—In combination with a foot-stove, the several parts thereof being arranged in the order specified, the employment of a lamp constructed with an intermediate space filled with plaster of Paris, or the equivalent thereof, whereby I am enabled to prevent the heating of fluid contained therein.

207. MACHINE FOR TURNING SKINS; Isaac C. Mayer, Jersey City, New Jersey.

Claim—The implement, constructed and operated as herein described, for the purpose of turning the skins used by furriers.

208. FURNACE GRATES; E. I. McCarthy, Saugerties, New York.

Claim—A furnace with a series of stationary grate bars, in combination with a series of movable blades, so arranged as to pass between and above the bars, and descend below so far as not to obstruct the draft and be beyond the influence of the intense heat of the furnace.

209. EXCAVATING AND GRADING MACHINE; Z. N. Morrel, Cameron, Texas.

Claim—1st, The employment of a revolving cylinder of blades, arranged at the lower end of the inclined digger, in combination with said digger, and with a series of coulter ploughs, arranged at the front end of the machine. 2d, The employment of a revolving cylinder of teeth or blades, arranged at the upper end of the inclined digger, in combination with said digger.

[By this invention the soil is first cut up in long narrow slices, then divided transversely into small clods, next elevated and pulverized, and then conveyed by endless longitudinal apron conveyers, which discharge it at right angles to or on one side of the grade or ditch.]

210. MACHINE FOR SCOURING AND POLISHING COFFEE; William Newell, Philadelphia, Pennsylvania.

Claim—The combination of the two cylinders, having a space between them, with the scarified arms or beaters moving in contrary directions.

211. RAILROAD CAR BRAKES; William Perkins, Plympton, Massachusetts.

Claim—1st, The arrangement of the sliding buffers, brake levers, rod, i, hooked rods, b b′, and staple, to operate in combination with the brake. 2d, Arranging the brake shoes, in combination with the staple and hooks, m m′. 3d, The arrangement and combination of the hooked rods, l l′, and the rods, o o′, and with the staple, so that the hooks, m m′, can be adjusted according to the direction in which the car is to run. 4th, The arrangement and combination of the sliding buffer, lever, and spring, as specified.

212. MODE OF HEATING DRYING CYLINDERS BY STEAM; A. P. Pitkin, Hartford, Connecticut.

Claim—In combination, the closed heating cylinders, force pump, vacuum valve, and connecting tubes, in the manner set forth.

213. SAW GUMMER; William Porter, Mexico, New York.

Claim—1st, The arrangement and combination of the lever with the sliding box by means of the bar, m, so as to give a continued and downward action upon the cutter or burr by the use of the coiled springs, thereby feeding the said cutter or burr. 2d, The arrangement and combination of the index pointers, with the index and the bars, t t′, connected to the frame, so as to give any required direction to the cutter or burr. 3d, The use of the set-screw by means of which the distance between the blocks is adjusted proportionally to saw plates of different thicknesses prior to being fastened thereto by the eccentric lever.

214. OSCILLATING STEAM ENGINES; John A. Reed, Jersey City, New Jersey.

Claim—The arrangement of the reversing valve in a steam chest on the top of a bridge-piece, in combination with the separate passages in the bridge-piece communicating the chambers in the trunnion boxes.

215. APPARATUS FOR WORKING PUMPS; Benjamin Robbins, Machias, Maine.

Claim—The combination and arrangement of the crank, fly-wheel, lever, walking beam, and piston rods, as set forth.

216. FURNACE FOR DENTAL PURPOSES; Edward A. L. Robbins, City of New York.

Claim—The arrangement and application of the double inclined grates, as set forth. Also, in combination with such inclined grates, the parts to contain the muffle, retort, &c., as set forth.

217. HAY PRESS; Charles Rundlett, Alden, and John W. Drummond, Winslow, Maine.

Claim—The arrangement of the driving drum or windlass and driving gear with reference to the press-box and the platen screws and their pinions, disposed on the sides of the press-box. Also, the combination and arrangement of the connecting rods and rings with each platen-elevating screw, and the bars of the cover of the press-box, the whole being to operate as specified. Also, the mode of applying the draft-rope guide to the press frame and the driving pulley, that is, by means of a fulcrum, and the screw or projection made to enter the helical groove of the driving pulley.

218. EDGE PLANES; Henry Sauerbier, Newark, New Jersey.

Claim—The bevel wheel, e, pinion, worm, wheel, o, socket shaft, pinion, feed wheel, cutter head, gauges, roller, lever piece, and corliss head, arranged as specified.

219. HYDRAULIC MOTOR; Morrill A. Shepard, Orin, Illinois.

Claim—The combination of the vacuum tube, e, and tube, c, for giving motion to the water-wheel by the action of an undammed stream, as described.

220. METALLIC BUNG; T. Briggs Smith, Marietta, Ohio.

Claim—A metallic screw bung for casks, or other wooden vessels, for holding liquids, with a knife-like thread, and an elevation at any point between the threads, and a shoulder on the bung let into the stave.

221. FURNACES; Lewis Solomon, City of New York.

Claim—So constructing a desulphurizing furnace for roasting the ores of precious metals, as that the heat shall be applied first beneath the sole of the furnace and afterwards on the surface of the ore, when the same is combined with a chamber arranged in the base of the chimney for the reception of such volatilized particles of ore, &c., as may be driven off by heat or carried over by the draft.

222. Snow Ploughs; M. B. Spafford, Warsaw, New York.

Claim—The vertical rotary shaft with its spiral wings for the removal of snow from the railroad track, as described.

223. Lasts; Obed S. Squire, New Haven, Connecticut.

Claim—The arrangement and combination of the longitudinal sections, strips, and bolt, as described.

[By this improvement the manufacture of india rubber boots and shoes is much facilitated, the lasts being made in two halves, so that the shoe or boot can be widened without the length being increased and varieties of shape obtained without the necessity of tabs upon the last.]

224. Meat-masher; George Storer, New Britain, Connecticut.

Claim—The hollow or solid cylinders with pointed angular teeth, the base of which teeth has nearly in contact, and in combination therewith, the device for adjusting the cylinders, as specified.

225. Stoves; John G. Treadwell, Albany, New York.

Claim—The combination of the division, c, with the damper and doors, arranged in the manner specified.

226. Stoves; John G. Treadwell, Albany, New York.

Claim—The employment of hinged plate, in combination with the hearth-plate above, the two being used in the manner specified.

227. Elbow for Stove Pipes; A. K. Tupper, Clarkson, Michigan.

Claim—Constructing the joint of pipes with flanch, f', and the overlapping flanch, f, so as to allow the pipe to be adjusted at any desired angle.

228. Machine for Cutting Heels and Soles for Boots and Shoes; Albert Warren, Jefferson, Ohio.

Claim—The bent knife, y, resting on the shoulders of the movable slides, as described. Also, the knife, y, resting on the shoulders, in combination with the knife, q, adjusted as set forth, and by which any size or shape of leather may be cut, ready to be sewed or pegged upon the boot or shoe.

229. Harvesters; W. A. Wood and J. M. Rosebrooks, Hoosick Falls, New York.

Claim—In combination with a main frame supported upon two driving wheels, and which frame carries the shaft and main cog-wheel, a second frame, hinged to said shaft, so that the crank shaft on said second frame shall always be in a radial line to the main cog-wheel, however much said second frame may vibrate on the main frame.

230. Fastening for Bedstead Drapery; George W. Watrous, Hartford, Connecticut.

Claim—A drapery fastening, constructed of a case, hook, and link, as described.

231. Pumping Engine; Henry R. Worthington, Brooklyn, New York.

Claim—1st, The combination set forth and exhibited of two direct-acting pumping engines, propelled by steam or other fluid, so arranged as that each engine shall actuate the inlet and outlet valves, governing the motive power of the other, thereby ensuring the constant action of at least one pump piston upon the water, and relieving the action of the pump from shocks and concussions. 2d, The arrangement shown of two distinct systems of levers adapted to the steam and exhaust valves of each engine, the one system to be operated upon for producing motion and for determining the duration of the repose of the piston at the termination of the stroke, the other for bringing the pistons to a state of rest.

232. Railroad Switches; Jacob Beachler, Assignor to self and J. F. Brickley, Anderson, Indiana.

Claim—The obstruction or "scotch" applied to the turn-out and connected with the switch so as to be operated automatically by the movement of the same.

233. Elbows for Stove Pipes; Norman Bedell, Assignor to S. P. Bedell, Albion, New York.

Claim—1st, The employment of the metallic frame, constructed in the manner set forth. 2d, The combination of the clasp with the frame, as constructed, for the purpose of holding the miter edges of the pipe together.

234. Machine for Polishing Corks; H. F. Cox, Jersey City, New Jersey, and Alex. Miller, City of New York, Assignors to H. F. Cox, aforesaid.

Claim—The cork-polishing machine, consisting of a series of rollers roughened by a surface of pumice-stone, or equivalent abrading material, and a brush or brushes acting in conjunction to polish the cylindrical portion of machine-made corks.

235. Dies for Shaping Articles in Metal; Levi Dodge, Assignor to self and Dodge & Blake, Waterford, New York.

Claim—The forming of articles of iron, or other metal, when such articles are to be shaped by a simultaneous action or pressure of dies on several or all sides, the employment of the movable dies, operating substantially upon the principles set forth.

236. Corn Huskers; Moses H. Gragg, Assignor to self and T. N. Page, South Boston, Massachusetts.

Claim—The arrangement and combination of the small intermediate conical roller, larger conical rollers, guard, and hopper, as described.

237. Stoves; Joseph C. Henderson, Assignor to Rathbone & Co., Albany, New York.

Claim—1st, The air-space between the oven and the fire, when so arranged that a descending draft the whole width of the stove passes through said space, and thence to the fire, for promoting combustion, and at the same time rendering the temperature of the oven more uniform. 2d, The damper at the front end of the oven, in connexion with the descending flue between the front plate and fire-box, whereby the oven can be entirely closed when the stove is in use for roasting.

238. Churn; Lorenzo Lake, Assignor to self and Wm. Patton, Middlebury, Pennsylvania.

Claim—The dasher, made in the manner as described, when the same shall be operated by the devices, as described.

239. Journal-boxes for Railroad Cars; Robert McWilliams, Assignor to S. H. Hoffman, Philadelphia, Pa.

Claim—1st, The upper half of the box with its socket formed by the flanches, in combination with the lower half of the box, when the two halves are arranged so that on adjusting the lower half to its place it may assume the position shown in fig. 1, and so that when adjusted the end of the oil chamber shall be close to the axle. 2d, The self-adjusting leather packing and the metal plate, when both are dependent upon the

lower half of the box for their proper position within the other half, and when they are otherwise arranged in respect to both upper and lower half of the box, as set forth.

240. SEWING MACHINES; Louis Planer, Assignor to self and Joseph Auger, City of New York.

Claim—The combination of the peculiarly constructed notch which is confined to the upper half of the shuttle, and leaves the lower half intact, with a driver having a single horn or finger, which entering the said notch constitutes a guard to prevent the flying up of the heel of the shuttle.

241. HARVESTING MACHINES; George W. Richardson, Assignor to self and G. M. Weed, Grayville, Illinois.

Claim—The application of the rack upon the reciprocating bar and pinion upon the vertical shaft, connected and arranged for operating the two sickles at the same time by the cam wheel.

242. DAMPER FOR COOKING STOVES; Lyman L. Thomas, Dighton, Massachusetts, Assignor to the Dighton Furnace Co.

Claim—A damper placed in the outlet of the return flue of a cooking stove, near the termination of said flue, and of such a form that when secured or hinged at its lower end to the side of the flue opposite the oven, and when partially or fully closed it shall stand in a position more or less diagonal across the flue, and of such a length that it can never be moved more than twenty-five degrees from a perpendicular.

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243. MODE OF SETTING LOGS IN SAW-MILLS; Asa Brooks, Tolland, Connecticut.

Claim—The application and combination of the gear and screw-shaft, the traveling ratchet and chock, the steps and the spring pawl, for the purpose as described.

244. BREAD SLICER; H. F. Bond, Hudson, Wisconsin.

Claim—1st, The movable tray operated automatically by the motion of the knife, in the manner set forth. 2d, The bar, arranged as described.

245. TWEER; S. L. Bond, Greenwood, South Carolina.

Claim—The arrangement and combination of the two pipes, C C, having their orifices opposite to each other, with the air chamber, so that the two currents of air on entering the chamber will oppose each other, and thus uniformly diffuse the air, as described.

[The invention consists in introducing air from the bellows-pipe, and compressing it to a certain degree into an air chamber, the cover of which is perforated with a number of holes, so that the air escaping from the chamber is spread over a comparatively large area and with a uniform force. This cover when burnt out is so arranged as to be easily replaced by a new one.]

246. IRON FOLDING BEDSTEAD; John Biberthaler, City of New York.

Claim—The arrangement of the bed bottom in two parts, one of which, A, being about two-thirds of the whole length of the bed, and to which the legs are attached capable of turning under said part, when required, and attaching the other part, D (and which forms the upper or head part of the bed), to the legs nearest the head, in such a manner that the said part, D, may be turned over the top of the bottom part, A, while the legs to which the same is attached are turned under the said part, A, in the manner described. Also, fixing the head part of the bed, D, when unfolded, either to the legs, B, or to the bottom part, A, by means of bolts or pins, in such a manner that by said bolts the inclination of said part, D, may, at the same time, be regulated to any desired position.

247. REEFING SAILS; Henry Bessling, City of New York.

Claim—The slides, applied to work along the jackstay, or other suitable portion of the yard, in combination with reef-points extended from the back sail up through the jackstay or yard, and with the reef pendants. And, without confining myself to the particular construction of the pawls, I claim securing the reef by means of pawls applied to the yard, to operate in combination portions of the reef pendants made of chain.

[This invention consists in carrying the points of each reef of a sail up to the yard, and attaching them to slides which are fitted to work along the yard, and to which are attached the reef pendants. By hauling on the reef pendants, the slides are caused to move longitudinally, and to draw up the reef points, and so reef the sail from the deck.]

248. STEREOSCOPIC INSTRUMENTS; Alex. Beckers, City of New York.

Claim—1st, Placing the eye-glasses in a movable cylinder, in such a manner that opaque pictures, placed back to back, may be viewed by the same pair of eye-glasses, the direction of the said eye-glasses being varied by the partial rotation of the cylinder, to suit the opposite position of the pictures. 2d, The construction of the picture-holders with a double hook.

249. MACHINE FOR STONING CHERRIES; E. C. Custer, Evansburgh, Pennsylvania.

Claim—The machine for stoning cherries, constructed in a manner specified, with its spirally grooved cylinder and adjustable stripper, arranged as set forth.

250. FLOUR BOLTS; J. M. Clark, Philadelphia, Pennsylvania.

Claim—The slide valve, or a series of slide valves, without holes in them, so arranged and operating with the apertures in the sides of the bolting chest, that either of these apertures can be opened or closed or both closed when required, for the purpose of turning the material as desired, in either of the three directions.

251. STEAM HEATING APPARATUS; B. Wells Dunklee and W. B. Moore, Boston, Massachusetts.

Claim—The combination of the tubes, casing, inner and outer reservoirs, and condensation pipes, and escape pipe, with its valve, with petticoat chamber and vaporizing pipe, and the use of the iron known as the Poleux patent metal alloy coating, as set forth.

252. DOOR FASTENING; Charles Frost, Waterbury, Connecticut.

Claim—The employment or use of the drop plate, constructed of the form and applied to the door or doors, as set forth.

253. HARVESTERS; Henry Fisher, Alliance, Ohio.

Claim—Attaching the draft or draw bars to the arms, L L', in the manner set forth. Also, the peculiar arrangement and combination of frames, tongue, spur, and arm, g, in relation to each other and to the main shaft, to operate in the manner specified.

254. MACHINE FOR FEEDING PAPER TO PRINTING PRESSES; G. H. Ferguson and Sylvester Ferguson, Malden Bridge, New York.

Claim—Feeding sheets of paper, singly, to a printing press, paper-ruling, or other machine, requiring the feed of a single sheet at a time, by means of a feed roller, G, feed roller, I, and adjustable friction stop, or the equivalents thereof, arranged as specified.

255. LOCOMOTIVE BOILERS; B. L. Griffith, Hazleton, Pennsylvania.

Claim—The deflectors, arranged within the space between the fire-place and the tube sheet of a locomotive boiler, in combination with openings in the fire-box for the admission of atmospheric air.

256. SEWING MACHINES; E. A. Goodes and E. L. Miller, Philadelphia, Pennsylvania.

Claim—The combination of the needles, the hook, and the tongue, arranged as described.

257. SUBMARINE HELMET WINDOW; C. M. Gould, Worcester, Massachusetts.

Claim—The application to submarine helmets of the above described window, in the manner described.

258. PIANO-FORTES; Charles Glassborow, Philadelphia, Pennsylvania.

Claim—Constructing the string frame of an upright piano with two pin blocks, and other appliances for receiving two sets of strings, and two distinct sounding boards, the strings being arranged one set on one side, and the other set on the opposite side of the frame, the two sounding boards being connected together, and the whole being otherwise constructed in the manner set forth.

259. VALVES FOR WATER-CLOSETS; James Gilfillan, Hartford, Connecticut.

Claim—The combination of elastic tubular spring, piston, and chamber, operating in the manner described.

260. FURNACES OF LOCOMOTIVE ENGINES; Richard Gill and G. W. Grier, Altoona, Pennsylvania.

Claim—In combination with the fire-box of a coal-burning locomotive boiler, a water deflector, having a series of small openings through it, and extending up over the fire, as represented, and an air passage behind or over it, which communicates with the external air, for the purpose of introducing atmospheric air in small jets over the fire.

261. PUMP; Enos Hartzler, Orville, Ohio.

Claim—The arrangement of the pipes, valves, springs, x x x x, and spring, a, with the rod, box, and stock, combined and operating as specified.

262. SAWING MACHINE; E. H. Hancock, Augusta, Georgia.

Claim—1st, The combination of the yielding guard levers, or their equivalent, with the rotary saws, as described. 2d, The head blocks, swinging guide, circular saws, and guard lever, arranged as set forth.

263. SEWING MACHINES; Wm. Hall, North Adams, Massachusetts.

Claim—1st, The combination of the needle-carrier, pivoted bar, connecting rod, J, slide, I, pitman, and crank, arranged in the manner set forth. 2d, The combination of slide, I, and rod, J, or its equivalent, with a vibrating needle-carrier, in such manner as to produce two vertical motions on the needle, during each single horizontal motion of the slide, I, in the manner set forth.

264. WASHING MACHINE; George Hall and Alonzo Scudder, Morris, New York.

Claim—The employment of a corrugated flexible metallic concave, stretching across the lower part of the machine, as described.

[A corrugated concave is used in connexion with a swinging, corrugated, and convex rubber, both being placed in a suitable box or case.]

265. ROTARY PUMPS; C. H. Hersey, Boston, Massachusetts.

Claim—The combination of the flanched shaft with the hinged valve and cone, as described.

266. BEDSTEAD; Benjamin Hinkley, Troy, New York.

Claim—The arrangement of the dovetailed tenons on the end rails, and corresponding dovetailed mortises in the full posts, with the side rails and longitudinal tension rods, as set forth.

267. WATER AND ALARM GAUGE FOR STEAM BOILERS; F. A. Hoyt, Boston, Massachusetts.

Claim—The arrangement of the balanced valve chamber and valve, the leading pipe thereof, and the whistle, with reference to the dry steam chamber, the indicator chamber, and the valve lever, and the indicator hand, connected together and arranged in the two chambers, as specified.

268. PRINTING MACHINES; Richard M. Hoe, City of New York.

Claim—Stopping the sheet of paper as it issues, after its first side is printed, and imparting to it a retrograde motion, thus returning it backwards, or in reverse order, to the impression cylinder, for the purpose of printing the second side, by the means described.

269. FORCE PUMPS; Frederic Kettler, Milwaukie, Wisconsin.*

Claim—The combination and arrangement of a force pump, as described.

270. FORCE PUMPS; Frederic Kettler, Milwaukie, Wisconsin.

Claim—The combination and arrangement of a force pump, as described.

271. MILLS FOR CRUSHING QUARTZ; George T. and Wm. F. Kearsing, Butte City, California.

Claim—The arrangement and combination of the driving shaft, arms, rods, and runner, as described.

272. MACHINES FOR ENAMELING MOULDINGS; Robert Marcher, City of New York.

Claim—1st, The elastic or yielding sides of the hopper, arranged as set forth. 2d, In combination with the hopper, the reciprocating dog attached to the bed, and operated as shown, and also in combination with said hopper, the feed rollers, either or both feeding devices being employed for the purpose specified.

273. BEDSTEAD; Charles Messenger, Warren, Ohio.

Claim—The angular and oblique slot and pin, in combination with the plate or key, when arranged in connexion with the jointed rails, as described.

274. SEWING MACHINES; Joseph W. Morton, Plainfield, New Jersey.

Claim—My improved loop-check or thread-holder, for the Wheeler & Wilson sewing machine, viz: a loop-check or thread-holder, which is composed of hair bristles, or other suitable fibres, by compacting them

into a firm mass of suitable size, and then combining the same with a sewing machine, in such a manner that the ends of the said fibres will bear against a portion of the rotating hook of said machine.

275. MACHINES FOR MANUFACTURING WAVED AND CORRUGATED METAL PLATES; Richard Montgomery, City of New York.

Claim—The combination of the peculiarly constructed roll, I, with the peculiarly constructed roll, J, arranged in relation to each other, as shown, whereby the manufacture of the waved corrugated metallic plate, with margins of greater thickness than the middle, as patented to me on the 21st of June, 1859, is facilitated, while a portion of each corrugation is formed at the same time, as described.

276. MACHINE FOR MANUFACTURING WAVED AND CORRUGATED METAL PLATES; Richard Montgomery, City of New York.

Claim—The combination of the peculiarly formed roll, I′, with the peculiarly formed roll, J′, arranged and operating in relation to each other, as shown and set forth, whereby the manufacture of the waved, corrugated, metallic plate, with margins of greater thickness than the middle, as patented to me on the 21st of June, 1859, is facilitated, while only "one corrugation" is formed at the same time, as described.

277. SHIRT STUDS; Daniel Morris, Bangor, Maine.

Claim—The improved manufacture of shirt studs, as constructed, with a metallic facing and an anti-soiling spool or guard, arranged as specified.

278. PLATFORMS BETWEEN RAILROAD CARS; Joseph Newman, Baltimore, Maryland.

Claim—The expanding mesh or lattice work described, when attached by a single point at each end, in the manner set forth, to be used as a bridge or gangway between railroad cars.

279. GATES FOR RAILROADS; Ira Robbins, Hughesville, Pennsylvania.

Claim—The shafts, s s′, having arms, as described, in combination with the shaft, B, lever, A, train of wheels, c c c, spring detent, g, spring, f, and the several rods connecting the aforesaid parts, as set forth, for operating the sliding gate.

280. SPRINGS FOR RAILROAD CARS; David B. Rogers, and Joel A. Wood, Pittsburgh, Pennsylvania.

Claim—The combination of a series of plate springs, arranged as described, with a box in which they are inserted, and a follower, the spring box being either separate from or forming part of the truck, in the manner set forth. Also, making and using the plates or leaves of the spring of different thicknesses in the same series, for the purpose of adapting the spring to the varying degrees of pressure to which it may be subjected from time to time.

281. GOLD WASHERS; Harrison Roberts, Mormon Island, California.

Claim—The arrangement of the sluice, in combination with the hopper and with the supply channel, in such a manner that the water strikes the dirt from below, and that the hopper is made self-supplying.

282. BISCUIT BOARD; Isaac R. Shank, Buffalo, Virginia.

Claim—The arrangement and combination of trap-boards, beveled strips, levers, and vertical pins, in the manner set forth.

[This is a frame or chest so constructed as to hold meal and flour, with a table on the top on which the dough can be worked, and trap-doors in this table which, when closed, are perfectly flush with it, can be opened into the flour or meal receptacles by simply pressing on pins, they being opened and closed by a system of levers and pins.]

283. SHIRT STUDS; Henry Simon, Providence, Rhode Island.

Claim—The movable elbow piece, spring, and lever, applied in combination with each other and with the fixed shank, and in relation to a fixed elbow piece, as described.

284. SEWING MACHINES; Isaac M. Singer, City of New York.

Claim—Making the needle-carrier with a mortise, in combination with the needles, a series of blocks having parallel sides grooved to receive the needles, and with a clamp screw, or its equivalent.

285. NINE-PIN BALLS; John Taggart, Roxbury, Massachusetts.

Claim—The nine-pin ball, composed of a hollow metallic body and a covering of india rubber, or other suitable elastic material.

286. BORING TOOLS; George J. Washburn, Worcester, Massachusetts.

Claim—Giving the stock or shaft of a boring screw, driving, or other tool, a continuous rotary motion in one and the same direction, by means of a nut or sleeve, which is moved in a rectilinear reciprocating direction on said shaft.

287. CONSTRUCTION OF RAILROADS; Amos Webb, Savannah, Georgia.

Claim—The arrangement of the ties in alternate reversed inclined positions, as described.

[This invention consists in placing or laying the ties or sleepers of railroads angularly in the ground, or in such position that their sides will be inclined relatively with vertical planes and their upper surfaces inclined from a horizontal plane.]

288. APPARATUS FOR WARMING BY STEAM; Charles A. Wilson, Cincinnati, Ohio.

Claim—The valves, adapted and arranged in the lower or discharging end of the branches, coils, or radiators of a system of steam heating pipes, and closable automatically by heat, in the manner explained.

289. STEAM RADIATOR; Charles A. Wilson, Cincinnati, Ohio.

Claim—The arrangement of a series of tubes or boxes provided with corresponding apertures and nozzles, to permit circulation of steam and receive bolts or rods, which extend from top to bottom of the tier, the whole being adapted to admit of varying the extent of radiating surface while that of the floor room occupied remains unchanged.

290. CHURN DASHERS; Parker Wineman, Loydsville, Ohio.

Claim—A cylindrical dasher for churns formed with a perforated top provided with a movable cap or cover and with hinged valves, arranged in such manner that cream may be received within the dasher at each downward motion thereof.

291. SAFETY GUARD FOR A FERRY WHARF; Edward F. Woodward, Brooklyn, New York.

Claim—The employment of the apron, for the purposes set forth.

292. VENETIAN BLINDS; George H. Woodworth, Brooklyn, New York.

Claim—The eyes or staples passing the cords and attaching the tapes to the blind slats, in the manner specified.

293. ORE WASHER AND AMALGAMATOR; John N. Wyckoff, Brooklyn, New York, and Thomas M. Fell, Orange Mines, Virginia.

Claim—A concentrator, constructed with a series of boxes or partitions, having curved bottoms communicating one with the other, and driven transversely for the purpose of separating poor from rich deposit.

294. GOLD AMALGAMATOR; John N. Wyckoff, Brooklyn, New York, and Thomas M. Fell, Orange Mines, Virginia.

Claim—The application of heat by steam, or otherwise, to vessels, pans, or cylinders, keeping the contents well triturated or mixed at an elevated temperature, so as to amalgamate the prepared ore by the use of mercury and alkali, as specified.

295. WOOD SAW; Eliza Blake (Executrix of Robert Blake, deceased), Assignor to Blake & Son, Albany, N. Y.

Claim—The new manufacture of wood saws, in the manner set forth, meaning by this, to claim only the sole right to manufacture, according to the mode of construction herein set forth, the special kind and character of saws known as wood saws, and clearly defined and represented in the description and drawings.

296. CLOTHES FRAME; J. Burr, Baltimore, Maryland, Assignor (through mesne-assignment) to George A. Fayman, Washington City, D. C.

Claim—The seat, capable of movement on the shaft in one direction only, and provided with the weighted detent and the ring movable thereon without bearing against the shaft, in combination with the shaft, arms, braces, and cords, arranged as described.

297. PIANO-FORTES; J. W. Fischer, Assignor to self and Charles Fischer, City of New York.

Claim—The bar beneath the dampers and above the piano strings, actuated by the levers, or their equivalents, in the manner specified.

298. SCREW STOCKS; Simeon Goodfellow, Assignor to self and John Fish, Troy, New York.

Claim—The cutting die, in combination with the vibrating circular plug and the movable holder, arranged as specified.

299. CHURN; Alfred Guthrie, Assignor to Wardell Guthrie, Chicago, Illinois.

Claim—The combination and arrangement of the cranks connected by the plate, or its equivalent, in the manner described.

300. GLASS-POLISHING MACHINES; Albert H. Hook, City of New York, Assignor to Wm. A. Horstman, Brooklyn, New York.

Claim—The combination of the apparatus for producing the reciprocating longitudinal motion and continuous lateral motion given to the polishing blocks, consisting of the screws, worm-wheel, worm, and its connexions with the driving power.

301. FIRE-ESCAPE LADDERS; Hezekiah Johnston and Wm. J. Matthews, Assignor (through mesne-assignment) to Hezekiah Johnston, Collinsville, Illinois.

Claim—The combination of the endless belt with the folding ladders and the platform, in the manner described.

302. MACHINE FOR CRACKING SUGAR; James H. Murrill, Assignor to Egerton, Dougherty, Words & Co., Baltimore, Maryland.

Claim—The employment of a vibratory saw, in combination with a gauge plate and hopper, arranged for sawing off slabs of sugar and directing them between crushing rollers. Also, the employment of rollers moving in unison with each other, constructed with cruciform cutters, for the purpose of perfectly dividing slabs of sugar into regular cubic portions. Also, the construction of a hopper provided with parallel grooves, or their equivalent, in combination with a circular saw, constructed in the manner set forth.

303. COFFIN SCREW; W. H. Nichols, Assignor to A. H. Markham, W. H. Nichols, and David Strong, East Hampton, Connecticut.

Claim—The employment of plates, or their equivalent, for the purpose of securing or retaining the caps or covers of coffin screws or tacks.

304. HOISTING CRANES; J. Y. Parce, Assignor to self and D. B. DeLand, Fairport, New York.

Claim—The main arm of a crane, arranged with the double diagonal braces and with the guide rollers, to operate in combination with the arm jointed to the same by means of the oval pin, as set forth.

305. PORTABLE SAWING MACHINE; Samuel R. Smith and Philander P. Lane, Assignors to Lane & Bodley, Cincinnati, Ohio.

Claim—1st, The idle friction pulley, operating in combination with the arbor and feed driving a circular saw. 2d, In the described connexion with the transverse rack, the gearing, ratchet wheel, pawls, lever, and stop, which operate, by their rigidity, in one direction, to transmit a forward movement of the rack to the knee, yet permitting the retraction of said rack. 3d, The described arrangement and adaptation of the weighted eccentric friction pawl, for the exact retention of the knee to the place of setting. 4th, The described arrangement and adaptation of the perforated rack, pinions, knee, and screen, for the exclusion of dust.

EXTENSIONS.

1. FAN MILLS; Isaac T. Grant, Shagticoke, New York; patented July 10, 1845; extended July 5, 1859.

Claim—The manner in which I have arranged the screen and the chess-board, and combined them with the screens ordinarily used, so as to obtain two distinct currents of wind, and to subject the falling grain to the stronger currents below the screen and chess-board, thereby blowing off the heavier portions of foreign matter, whilst the chaff is blown off by the ordinary currents in the upper compartments of the shoe.

2. SHAPING IRREGULAR SURFACES IN WOOD; Warren Hale and Allen Goodman, Dana, Massachusetts; patented July 22, 1845; extended July 26, 1859.

Claim—The method of copying or forming the longitudinal irregularities of piano legs, and other similar articles, on rough blocks of wood, by means of a carriage moving longitudinally against the revolving cutter, and holding both the pattern and the rough block, the cutting tool being raised and depressed for depths of cut by rollers resting on the patterns.

Additional Improvements.

1. Preparing and Mounting Slates; Hubbard Beebe, New Haven, Connecticut; patented March 29, 1859; additional dated July 5, 1859.

Claim—The combination of leather, or cloth, or felt (or felting), instead of, or in addition to, india rubber and gutta percha, so far as beauty, and economy, and desirableness in use may require, with the metallic band or rim around the edge of the slate, as patented March 29, 1859. Also, the combination of leather and cloth with my metallic rim, or with a water-proof cement of such strength and stiffness as will warrant, to some extent, the disuse of said metallic rim, especially in mounting slates in portfolio form or forms.

2. Hanging Window Sashes; Theodore F. Hall, Marietta, Ohio; patented December 21, 1858; additional dated July 26, 1859.

Claim—The improved arrangement of cords, pulleys, and weights, for hanging the sashes of windows, so that either or both sashes can be retained in any desired position in the frame, the sash and weights being suspended and moving on cords attached to the frame.

3. Picker Sawing Machines; John Haw, Old Church, Virginia; patented June 23, 1857; additional dated July 26, 1859.

Claim—Attaching the saw guides to the overhanging bearing, so as to adjust them to the sawing of small logs.

Re-Issues.

1. Faucet; Albert Fuller, Cincinnati, Ohio; patented October 16, 1855; re-issued July 5, 1859.

Claim—The elastic plug valve attached to a stem, when operated by an eccentric, or its equivalent, as set forth. Also, the elastic plug valve constructed as described, in combination with the cup-shaped cap to prevent the cup from spreading.

2. Faucets; James Powell, Cincinnati, Ohio; patented March 22, 1859; re-issued July 5, 1859.

Claim—The described arrangement of the cam, flanches, longitudinal slot, and spurs, combined and operating in the manner and for the purposes set forth.

3. Billiard-table Cushion; John M. Brunswick, Cincinnati, Ohio; patented December 8, 1857; re-issued July 12, 1859.

Claim—That order in the arrangement of the material composing a billiard-table cushion which places the cork in the rear, the rubber in front of it, and the paper, leather, and cloth, or the equivalents thereof, outside, in the manner set forth.

4. Fire Engines; L. Butler and R. Blake, Waterford, New York; patented November 30, 1858; re-issued July 12, 1859.

Claim—Combining with the water way or channel, the air chamber divided into two compartments by contraction, at or about one-half the height of said air chamber above the base or point of attachment to said water way, in the manner set forth. Also, in combination with the hour-glass contraction of the air chamber, the ring enlargement of the rock-shaft, as set forth.

5. Cleansing Caoutchouc; Austin G. Day, Seymour, Connecticut; re-issued July 12, 1859.

Claim—The use of alkali, or its equivalent, for separating bark, sticks, or other foreign bodies from crude caoutchouc and other vulcanizable gums, to prepare them for manufacturing.

6. Treatment of Crude Caoutchouc; Austin G. Day, Seymour, Connecticut; re-issued July 12, 1859.

Claim—Charging the caoutchouc, or other like gum, with alkaline liquor, or the equivalent, by means of the exhausting apparatus described and represented.

7. Cut-off and Working Valves of Steam Engines; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The method, substantially as described, of operating the slide valves of steam engines, by connecting the valves that open and close the ports at opposite ends of the cylinder with separate crank-wrists, or their mechanical equivalents, so that from the motion thereof each valve, while its port is closed, shall move a less distance than it moves in opening and closing its port, while at the same time the two wrists by which the two valves are operated, have the same range of motion, as described, whereby I am enabled to save much of the power heretofore expended in working the slide valves of steam engines, and by which also I am enabled to make a greater proportion of the movement of the valve available for effecting a free passage of the steam through the ports of the cylinder.

8. Cut-off and Working Valve of Steam Engines; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The combination of liberating valve gear with valves which are moved parallel to their seats, and continue their closing motion after their ports are closed, and commence their opening motion before their ports open, as described.

9. Cut-off and Working Valves of Steam Engines; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The combination, substantially as described, of an air cushion with the liberating valve gear of steam engines.

10. Cut-off and Working Valves of Steam Engines; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The combination with the part of the valve gear that appertains to a liberated steam valve of an instrument moved by the power of the engine in such manner as to effect the closing of the liberated valve whenever the independent means provided for that purpose fail to act in time.

11. Cut-off and Working Valves of Steam Engines; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The combination of a helical cam with the opening and closing mechanism of the steam valve, as described.

12. CUT-OFF AND WORKING VALVES OF STEAM ENGINES; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The method, substantially as described, of regulating the velocity of steam engines by combining a regulator with a liberating valve gear.

13. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—Hinging the finger beam to the main frame, so that it can be folded up thereon, as described.

14. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—Hinging the coupling arm to the frame at one side of the main axle, and supporting it by a brace hinged to a frame on the opposite side of the axle, in such manner as to obtain among other things a wide basis for bracing on a short frame without interfering with the folding-up the finger beam against or upon the frame to render the machine more portable.

15. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The combination of the crank and the bearing for its journal, the cutter, the coupling arm, and the hinge of its inner end, with a hanger which is made the common support for the hinge of the coupling arm and the journal of the crank, arranged as set forth.

16. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The method of folding the finger beam upon the frame by aid of the coupling arm with a lifting lever and cord, or the equivalent thereof.

17. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—1st, The combination of a knuckle with the joint which connects the finger beam and coupling arm, and the lever for raising the finger beam off the ground, arranged as set forth. 2d, The combination of a lever, arranged to turn on a pivot and to vibrate laterally with notches, and a catch to support the lever at any required elevation, together with the coupling arm and finger beam suspended to it.

18. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The arrangement of the hand lever, driver's seat, and foot lever, whereby the driver may, when necessary, employ both his hands and his feet to raise the finger beam.

19. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The combination of the spring pawl and the teeth with the gib and key of the connecting rod and cutter.

20. MOWING MACHINES; C. Aultman and L. Miller, Assignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—The combination of the shoe which carries the end of the finger beam, next the main frame, with a hinge brace bar, whose axis of motion at the end connected to the main frame is in a line with that of the corresponding end of the hinged coupling arm.

21. MOWING MACHINES; Cornelius Aultman and Lewis Miller, Assignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—The combination, with the hinged coupling arm, of a hinged brace whose axis of motion, at the end next the main frame, coincides with that of the corresponding end of the hinged coupling arm.

22. MOWING MACHINES; Cornelius Aultman and Lewis Miller, Assignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—The construction and arrangement of the finger beam and the main frame, so that the beam may be turned on its hinge into an upright position, and then raised and leaned against the frame to elevate it out of the reach of obstructions and distribute the weight more equally upon the carrying wheels, when the machine is to be removed from one place to another where the mowing is to be done.

23. MOWING MACHINEE; Cornelius Aultman and Lewis Miller, Assignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—The combination of a hinged coupling arm, the finger beam, and a catch, whereby the finger beam can be turned, raised, and held up to render the removal of the machine from place to place more convenient and secure.

24. MOWING MACHINES; Cornelius Aultman and Lewis Miller, Assignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—Mounting the two driving wheels and one main gear-wheel upon a common axle, in combination with a ratchet wheel for each driving wheel, each ratchet wheel fitted with a pawl that can be made to stand in or out of gear with the ratchet teeth at will.

25. MOWING MACHINES; Cornelius Aultman and Lewis Miller, Assignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—The combination of a ratchet wheel, a ratchet pawl, a spring acting on the pawl, and a bearing pin, or the equivalent thereof, for the spring, with the driving wheel and the axle of the main gear wheel, whereby one spring is made to perform the two duties of holding the pawl, both in and out of gear, with the ratchet wheel.

26. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The combination of the inner shoe with a leading wheel, arranged as set forth.

27. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The combination with the shoe of an adjustable sole, of the peculiar double runner form described, whereby the sole can be adjusted directly to the heel of the shoe, without the intervention of a link rod and joint.

28. HARVESTERS; McClintock Young, Jr., Frederick, Maryland; patented September 21, 1858; re-issued July 19, 1859.

Claim—Connecting the handle of the rake to a transverse shaft in such a manner that the rotation of the said shaft, when aided by the curved guiding rod, or its equivalent, will impart the within described movements to said rake, viz: a sweeping axial movement from the inner edge of the sector-shaped platform (or a little beyond the same,) over to the forward portion of said platform, and at that point instantly changing to an axial horizontal movement across the platform to the starting point, and so onwards in regular succession.

29. CUT-OFF GEAR; George H. Corliss, Providence, Rhode Island; patented July 29, 1851; re-issued July 26, 1859.

Claim—Combining with the rocking levers, or their equivalents, for operating the valves, the shoulders on the spring bars, or their equivalents, as described. Also, in combination with the shoulders on the spring bars that operate the rocking levers, the employment of the gauge bars, or any equivalent therefor, to regulate the periods of closing the valves, whether the said gauge bars be regulated by a governor, or by other means.

30. RAILROAD CAR SPRINGS; David B. Rogers, Pittsburgh, Pennsylvania; patented Feb. 23, 1858; re-issued July 26, 1859.

Claim—Constructing a carriage or car spring of a series of two or more plates of steel, each of which is so curved or twisted that the longitudinal curve on one edge or side of each leaf or plate, shall be the reverse of the curve on the other side or edge; a longitudinal section through the centre of the plate midway from either edge is a straight line, or nearly so; said plates being so arranged relatively to each other that on both sides the curve at the edge of each leaf or plate, shall be in the reverse direction to the curve at the edge of the leaf or plate next above or below it.

31. TRIGGER-OPERATING REVOLVING-BREECH FIRE ARMS; James M. Cooper, Assignee of S. W. Marston, City of New York; patented January 7, 1851; re-issued July 26, 1859.

Claim—1st, So constructing the lock of revolving-breech fire arms, as that the trigger used to fire the pistol, when drawn back, raises the hammer to full cock and there retains it, the revolving breech or barrels being at the same time rotated so far as to bring the nipple of one of the chambers or barrels in the proper position to be struck by the hammer in its descent, and the trigger being held in a drawn position ready for instantaneous firing. 2d, The use of a fly-tumbler or vibrating tooth intermediate between the hammer and trigger in trigger-operating fire arms, and the peculiar arrangement of the parts of the lock in connexion therewith, hereinbefore described, whereby the tendency of the main spring to cause the descent of the hammer is neutralized when the hammer reaches the point of full cock, so that the hammer having been raised by the trigger, may either be permitted to stand cocked or fired immediately, at pleasure, and greater ease in firing and steadiness of aim are secured.

32. SKELETON SKIRTS; The Shelton and Osborn Skirt Manufactuirng Co., Birmingham, Assignees of E. G. Atwood, Derby, Connecticut; patented October 19, 1858; re-issued July 26, 1859.

Claim—A skirt formed of elastic hoops and tape, or equivalent material, when the tapes are disposed across the hoops in opposite diagonal directions, and interlocked on opposite sides of the hoops at the point of crossing, and are confined thereto. Also, connecting the hoops by means of a series of loops formed by a continuous tape, or equivalent material, passing around the skirt, from one hoop to the other, in opposite diagonal directions, without interlooping or interlocking between the hoops.

33. SKELETON SKIRTS; The Shelton and Osborn Skirt Manufacturing Co., Birmingham, Assignees of E. G. Atwood, Derby, Connecticut; patented October 19, 1858; re-issued July 26, 1859.

Claim—A skirt formed of elastic hoops and tape, or equivalent material, disposed across the hoops in opposite diagonal directions, without being connected between the hoops, but connected to the hoops at suitable intervals.

DESIGNS.

1. COOKING STOVES; James Greer and Rufus J. King, Dayton, Ohio; dated July 5, 1859.

2. SIDES AND DOORS OF COOKING STOVES; James Greer and Rufus J. King, Dayton, Ohio; dated July 5, 1859.

3. SPOON AND FORK HANDLES; Henry Hebbard, City of New York; dated July 5, 1859.

4. SUN-DIALS; William W. Wilson, Pittsburgh, Pennsylvania; dated July 5, 1859.

5. FLOOR OILCLOTH; James Bogle, West Newton, Massachusetts, Assignor to self and Daniel Bogle, Dover, New Hampshire; dated July 5, 1859.

6. FLOOR OILCLOTH; James Bogle, West Newton, Massachusetts, Assignor to self and Daniel Bogle, Dover, New Hampshire; dated July 5, 1859.

7. STOVES; Garrettson Smith and Henry Brown, Assignors to J. G. Abbott and A. Lawrence, Philadelphia, Pennsylvania; dated July 5, 1859.

8. FIRE FRAMES; Wm. W. Stevens, Westbrook, Assignor to N. P. Richardson & Co., Portland, Maine; dated July 5, 1859.

9 to 12. CARPET PATTERN (four cases); E. J. Ney, Lowell, Massachusetts, Assignor to the Lowell Manufacturing Co.; dated July 5, 1859.

13. CLOCK CASES; John A. Munn, City of New York; dated July 26, 1859.

14. COOK STOVE; David Hathaway, Assignor to Fuller, Warren & Co., Troy, New York; dated July 26, 1859.

15. COOK STOVE; George W. and John Pittock, Union Mills, Assignors to —— Mosher and H. M. Chase, West Providence, New York; dated July 26, 1859.

16. PARLOR COOKING STOVES; Wm. W. Stevens, Westbrook, Assignor to N. P. Richardson & Co., Portland, Maine; dated July 26, 1859.

AUGUST 2.

1. AXLE-BOXES FOR LUBRICATING ROLLING STOCK, &c.; Paul Francis Aerts, London, England; patented in England, March 19, 1858.

Claim—The wheel fixed on the end of the journal in railway rolling stock, raising water by centrifugal force, and the divergent for conducting the water over the greased surface of the journal or moving parts of machinery working in fixed bearings.

2. CASTING COPPER CYLINDERS; Freeborn Adams, Somerville, Massachusetts.

Claim—A tube or cylinder cast out of copper, and free from blow-holes, and other similar defects, when stated.

3. KNITTING MACHINES; Jonas Bradley Aiken, Manchester, New Hampshire.

Claim—1st, The lever grooved eccentrically to its fulcrum, applied in combination with the sliding loop regulator to adjust the same for different lengths of loop. 2d, The stop-motion, consisting of the lever and its self-adjusting dog, the ring with its pins, or their equivalents, and the sliding bolt, or its equivalent, carrying the slipper.

4. TOOL FOR RIVING HOOPS; William Baker, East Templeton, Massachusetts.

Claim—A hoop-riving tool, formed of a stock provided with suitable guiding surfaces, and differently arranged or set stock surfaces and knives for operation, as set forth.

5. MODE OF HANGING BRAKE RUBBERS; T. C. Ball, Keene, New Hampshire.

Claim—The combination of the brake-head and spring, also, the arrangement of the brake-beam, so as to allow its independent action upon brake-head and spring.

6. SHOW-CASE; Thomas L. Ball, City of New York.

Claim—The construction of a case or box divided into compartments, each box having a sliding cover, in combination with the spring covers and compartments.

7. APPARATUS FOR CONDENSING COAL OILS; William T. Barnes, Buffalo, New York.

Claim—1st, The employment of a tube, the lower extremity of which is provided with tubular arms, the same being made to revolve, and being used in connexion with a tank partially filled with water, and a conducting pipe. 2d, The arrangement and employment of the tanks, constructed and used in the manner specified.

8. APPARATUS FOR GENERATING COAL OILS; William T. Barnes, Buffalo, New York.

Claim—1st, The arrangement of the levers, L K and J, and rod, whether operated by a cam or otherwise, for the purpose of forming an automatic dust clearer to coal oil retorts. 2d, The employment of the spiral or screw flanches on the head of the retort for pushing the material away from the hole in the journal.

9. MILLS FOR CRUSHING SUGAR CANE; Daniel Bassett, White Water, Wisconsin.

Claim—1st, The arrangement and combination of the tongue and groove rollers, wiper, and "stripper," as described. 2d, The "stripper," when composed of spring caps and a movable cam, and when arranged and combined with rollers.

10. ELEVATORS IN WAREHOUSES, FACTORIES, MINES, &c.; Albert Betterley, Boston, Massachusetts.

Claim—1st, The combination of an automatic safety shipper and brake apparatus with an elevator, arranged to operate only to prevent an elevation of the car beyond a fixed limit. 2d, The combination of the weight, flexible rope or chain, with the shipping and brake-controlling mechanism.

11. SPRING BED-BOTTOM; C. C. Bisbee, Rochester, New York.

Claim—The arrangement described of the slats, belts, rollers, cords, and springs, in the construction of spring bed-bottoms. Also, the unequal cams for the more perfect automatic adjustment of spring beds.

12. MACHINE FOR RAISING WATER, &c.; Abraham Bower, Pekin, Illinois.

Claim—The combination of the lazy tongs, the slide trough, and valvular bucket, as set forth.

13. MANUFACTURING HOES; Samuel Boyd, Brooklyn, New York.

Claim—The employment of an anvil, having an inclined face, groove or recess, and socket, in combination with a mandrel, whereby the bevel or set of the blade and eye, and the form, thickness, and bevel of the interior of the socket or eye will be uniformly and simultaneously produced.

14. PIPE TONGS; J. R. Brown, Boston, Massachusetts.

Claim—The arrangement and application of the serrated surface or rack, the spring, and toothed stopper, with respect to the two jaw levers, the clamp nut, and the screw-pin, applied to the toothed jaw lever.

15. DRAINING MACHINE; Moses Bucklin, Grafton, New Hampshire.

Claim—1st, The arrangement of the platform with the cutter blade and plough-share, for the purpose of cutting underground drains. 2d, Arranging the blade with a sloping cutting edge, so that the same may readily pass over obstructions which may come in its way. 3d, The arrangement and combination of the platform, the cutter blade, and the plough-share, with the adjustable bars and wheels, to operate in the manner described.

16. IRONING TABLE; John F. Galley, City of New York.

Claim—1st, The treadle, the fulcrum arm, the upright shaft, the side jaws, the spiral spring, and the thumb-screw, arranged as described. 2d, The hollow screw collar on the shaft, constructed as described.

17. PORTABLE FIELD FENCE; T. B. Garside, Danville, Iowa.

Claim—The combination of the long main posts, short auxiliary posts, and triangular pivoted brace, or its equivalant, arranged as set forth.

18. MANUFACTURE OF PHOSPHORIC ACIDS AND PHOSPHATES; Frederick Augustus Genth, Philadelphia, Penna.

Claim—The process of manufacturing phosphoric acid or phosphates, by treating the phosphates of iron alumina, or lead, by means of sulphuric acid, or its equivalent.

19. GAS BURNERS; James Gilfillan, Hartford, Connecticut.

Claim—The improvement in gas burners described, consisting of a central exit tube supplied with apertures, surrounded by the gas chamber, having its discharge regulated by the mercury cup, the upper end of said pipe being furnished with a nozzle or jet-burner.

20. CLOTH-HOLDER FOR WASHING CROCKERY, &c.; C. F. Greely, East Kingston, New Hampshire.

Claim—The described washing vise, constructed as set forth.

21. CHURN; W. S. Hall, Quincy, Massachusetts.

Claim—The combination of the frame of stationary transverse bars with the rotary hollow shaft and hollow arms thereto attached for the introduction of air, and the solid arms attached to the shaft.

22. RECUMBENT CHAIR; P. J. Hardy, Boston, Massachusetts.

Claim—The peculiar construction and arrangement of mechanism described for actuating the back and leg rest, whereby they cannot only be brought from a vertical into a horizontal, or nearly horizontal position, so as to constitute a couch, but be maintained in such or any intermediate positions that may be desirable, such mechanism consisting of the levers, c c and d d, connected with each other, the back and leg rest or leg rest frame, respectively in manner as set forth. And in combination with the said construction and arrangement of mechanism for actuating the said back and leg rest, I claim the arrangement of the locking contrivance, whereby the back and leg rest, when placed in any desirable position, may be firmly secured in such positions or be released therefrom, as circumstances may require.

23. BREECH-LOADING FIRE ARMS; A. V. Hill, Hinsdale, New York.

Claim—The combination of the bed-piece, breech-pin, and connecting rod, which in connexion forms the sliding process, and operating as described.

24. SEWING MACHINES; Hiram W. Hayden, Waterbury, Connecticut.

Claim—1st, The attachment of the looping hook to an arm, or its equivalent, which has a revolving motion, and also a vibrating motion, in a direction transverse to its revolution, in combination with a bobbin, arranged relatively to it. 2d, The stationary cam, applied in combination with the revolving arm which carries the looping hook, and with a spring and sleeve, or their equivalent, for holding the said arm in contact with the said cam, to produce the vibrating motion of the said hook. 3d, The combination of the stationary cam and the fixed portion of the bobbin-holder. 4th, The looping-hook, made and fitted to turn in the revolving and vibrating arm, and provided with a pin or projection, operating in combination with a fixed stop. 5th, The extension of the mandrel forward of the rotating hook, for the purpose of carrying the spring and a sleeve, or its equivalent, by which the revolving and vibrating arm, which carries the hook, is kept in contact with the cam from which it derives its vibrating motion. 6th, The adjustable pin, applied and operating in combination with the revolving and vibrating looping hook and the bobbin. 7th, Feeding the cloth or material to be sewed by means of one or more smooth-faced angular projections on the feed bar, or its equivalent, and one or more ratchet-like wheels attached to the presser, said wheels being arranged with the lowest portions of their peripheries, above the bottom of the presser foot, and the said projections pressing the material into one notch at a time of each wheel, and operating in combination therewith, as described.

25. CAR COUPLINGS; E. L. Keeler, Pittsburgh, Pennsylvania.

Claim—The combination of a beveled coupling-head, shaped as described, with a spring as a coupling for railroad cars.

26. SEWING MACHINES; David Kelsey, Harper's Ferry, Virginia.

Claim—The horned eccentric or cam, applied as described, in combination with the vibrating pressure pad and the feeding dog, sliding on the stem of said pad, and operated by means of a stud, or its equivalent, attached to the needle-bar.

27. TOOTH KEYS; B. F. Killam, Braintree, Vermont.

Claim—The hollow fulcrum, as described.

28. HARVESTERS; O. H. King, Salem, Iowa.

Claim—The arrangement and combination of the circular platform, rake, rod, guide way, endless chain or belt, wheels, and pin, arranged as set forth.

29. REVOLVING FIRE ARMS; S. C. Lewis and F. P. Pfleghar, Whitneyville, Connecticut.

Claim—1st, The centre-pin made in two pieces, one of which is fitted to the rotating cylinder, and to a rotating recoil shield with fins, and has applied to it within the cylinder a spring, and the other of which is fitted to slide and turn in the front part of the frame, and is capable of being locked to the frame. 2d, The dog, constructed and applied as described, to constitute its own spring, and operating transversely to the hammer, in combination with a peripherical ratchet. 3d, The stop, constructed with a tooth in its front, and a projection on its back, and applied and operating in combination with a spring, a ring of notches on the rear of the recoil shield or cylinder, and a tooth on the tumbler. 4th, The recoil shield, constructed with a peripherical ratchet, a ring of notches, a central bore, and slots.

30. BRAKES FOR RAILROAD CARS; H. A. Lincoln and H. T. Douglass, New Haven, Iowa.

Claim—The combined arrangement described of brake shoes, truck wheels, equalizing beams and springs, the former being outside of the wheels, and so supported as to rise and fall practically with the wheels, while the equalizing beams support the springs, and the springs are arranged between the wheels, and transfer the weight to be carried to the equalizing beams, the several parts acting in combination, in manner specified.

31. HARVESTERS; S. A. Lindsay, Unionville, Maryland.

Claim—The combination of the hinged guide-piece with the hinged platform, for the purpose of retaining the rake and the reels in their proper relative positions towards the platform, when the latter is raised or lowered. Also, the combination of the bar, shaft, and the hinged bar, with the movable frame of the machine, and the finger bar, for the purpose of raising and lowering the latter, without interfering with the free movements of the platform on its hinges.

32. MACHINES FOR CUTTING AND BINDING GRAIN; Frederick Meyer, Naperville, Illinois.

Claim—1st, The combination of the movable gates, the sliding divider, and the movable platform, as described. 2d, The construction of the tongs, and the mode of operating them. 3d, The tucker, for the purpose of fastening the free end of the band, as described.

33. MACHINE FOR EXCAVATING AND GRADING; Warren P. Miller, Marysville, California.

Claim—The use of the cylinders or wheels, for the purpose of depressing the chains so as to give to the excavators a proper inclination, and thereby facilitate the feeding and working of the same. Also, the construction and arranging of the excavators attached to endless chains, worked in the manner described, to wit: to fill and discharge, while traversing from one tumbler to the other, on the lower plane (from A to B), for the use and purpose of excavating and grading rail and turnpike roads.

34. JOURNAL-BOXES; John A. Montgomery, Williamsport, Pennsylvania.

Claim—A journal-box, formed of a sphere or segment of a sphere, fitting into a cup or concave, and prevented from revolving with the shaft or journal by a pin and slot, as described.

35. WASHING MACHINE; J. T. Mudge, Dayton, Ohio.

Claim—Arming the side of the tub and the plunger with round-headed knobs or pins, to act on the clothes, and allow the water to escape freely as it is pressed out of the clothes being washed.

36. Apparatus for Tapping Water or Gas Mains; E. T. D. Myers and C. F. Thomas, Washington City, D. C.

Claim—The method of drilling, tapping, and inserting stop or other cocks into cast iron water or gas mains or supply pipes, in the manner as set forth.

37. Branch-holder for Bonnet Stands; J. R. Palmenberry, City of New York.

Claim—A branch-holder, made and constructed in the manner described.

38. Manufacture of Common Salt; Henry Pemberton, East Tarentum, Pennsylvania.

Claim—The combination of processes described for the purification of common salt, to wit: washing common salt procured by the evaporation of salt water containing chloride of calcium and other impurities, with a saturated solution of chloride of sodium, or brine rendered pure by the use of chemical re-agents, substantially in the manner described, and the repeated use, for that purpose, of the same brine, for an indefinite number of operations, by treating it, after each process of washing the salt, with suitable chemical agents, whereby it is restored to its original purity.

39. Refining Coal Oils; Henry Pemberton, East Tarentum, Pennsylvania.

Claim—Recovering the sulphuric acid used from the residuum resulting from the process of the purification of coal oils, with sulphuric acid, by treating the residuum with water heated or caused to boil by steam, or otherwise, in the manner described.

40. Meat Cutter; John G. Perry, Kingston, Rhode Island.

Claim—Combining the revolving knives with a cylinder or block having studs on its surface, as set forth.

41. Machinery for Making Roofing Cement; Phineas Pomeroy and J. G. Allen, Middletown, Ohio.

Claim—The employment of the double-walled tank, in combination with the hollow metallic cylinders and valves, arranged as set forth.

42. Carriage Hubs; Jesse Pruette, Aurora, Illinois.

Claim—The enlargement upon box, having an annular flanch, for the purposes specified, in combination with the nut and its flanch, arranged as set forth.

[An annular flanch, with a concave recess formed on its inner surface, is cast upon the butt-end of the box, and this is driven into the hub. On the opposite end of the box a metallic nut is screwed, having a flanch upon its inner surface which projects into a corresponding cavity in the hub.]

43. Machine for Turning Hollow-ware; Lyman P. Rood, Deposit, New York.

Claim—The combination of the rotating mandrel with the adjustable slide provided with the tool-rest and cutter, arranged as set forth.

44. Sickle-guards for Harvesters; Andrew Shogren, Chicago, Illinois.

Claim—The cutter guard, constructed in the manner described, in combination with the guard socket and wedge-shaped bolt.

45. Corn Huskers; Daniel C. Smith, Tecumseh, Michigan.

Claim—1st, The combination of forceps, lever, stop, spring, and post, in the manner specified. 2d, The combination with the forceps of the slotted post, nut, and fork, in the manner specified.

46. Seeding Ploughs; John S. Snider, Lancaster, Ohio.

Claim—The arrangement of the swinging frame, wheel, crank shaft, with the hopper and mould-board, together with the devices connecting said parts, as set forth.

47. Machinery for Moulding Candles; George A. Stanley, Cleveland, Ohio.

Claim—1st, The moving of the moulds any distance lengthwise of the candles to detach the moulds from the candles formed in them, and to withdraw the moulds from the candles and place the jaws of the clutches around them. 2d, Moving the moulds by the weight of the moulds, and boxes containing the moulds, to adjust the jaws of the clutches to the candles, and attach the clutches firmly to the candles, so that they may be raised at the same time at which the moulds are returned empty to their first position.

48. Apparatus for Defecating Sugar; Richard A. Stewart, St. Bernard Parish, Louisiana.

Claim—The combination of the retort, the vacuum cylinder, and the receiver, in the manner set forth, and these I also claim, in combination with the steam boiler.

49. Brick Machines; H. W. Stillman, Port Washington, Wisconsin.

Claim—The combination of the revolving moulds, feeder, and plate, arranged in the manner described.

50. Flour-packers; Samuel Taggart, Indianapolis, Indiana.

Claim—1st, The oil-pot with cap, when operated in connexion with the clutch-wheel and shaft. 2d, The cam, in combination with the barrel-lifter, constructed as set forth. 3d, The combination and arrangement of the friction-brake, rod, walking beam, packing shaft, and barrel-lifter.

51. Pointing and Threading Wood-screws; N. G. Thom, Cincinnati, Ohio.

Claim—1st, The combination of a rotating head containing two or more spindles or blank-holders, revolving round a central point with an intermittent motion, with an apparatus for pointing and threading screw-blanks, so arranged and operated that while one blank is being pointed and undergoing the other operations necessary thereto, another blank is being threaded by another part of the same machine. 2d, In combination with an apparatus for pointing and threading screw-blanks, simultaneously, or nearly so, by the same machine, the apparatus so constructed and operated that while the spindles are rotated, or changing positions, the threading cam, or other device for operating the threading tool and its connexions, remains stationary, and when the motion of the spindles around the central point is arrested, the other part, and all necessary parts of the machine, recommence motion. 3d, The spring-brake, so constructed and operated that when the spring is being depressed to withdraw it from the notch in the plate, s, it acts as a brake upon the periphery of the plate, r, to arrest its motion, and the parts connected with it, at the same time relieving the plate, s, and allowing it to revolve with the spindles. 4th, The quadrant-shaped grooved arm on the pointing tool-stock, which, in connexion with the spring, or its equivalent, receives the blank from the hopper, and conveys it to the grippers, and supports it while being pointed. 5th, In combination with the quadrant, I claim the reciprocating motion of the hopper for the purpose of depositing the blanks in the quadrant, to be conveyed to the grippers. 6th, The triangular grooved cam, in combination with the hopper, so constructed that when moved in one direction by the action of the tool-stock, or otherwise, the hopper is depressed, and when moved in a contrary direction the hopper is elevated, for the purpose of depositing the blanks in the quadrant, or other mechanical device for receiving them. 7th, In combination with an apparatus for thread-

ing and pointing screw-blanks by the same machine, I claim the worm, when combined with the gears, or equivalent arrangement, by which the revolution of the worm causes the spindles to rotate round a central point. 8th, The rocking feed levers, for the purpose of regulating the depth of cut of the threading tool. 9th, The ratchet and revolving cam, when combined with the feed lever, for the purpose of raising the cutting tool out of the thread, in its backward motion, and increasing the depth of cut of the threading tool. 10th, In combination with the rod for opening the grippers, I claim the movable nut which acts upon the thread in the edge of the rod, to withdraw the cone and release the screw. 11th, The traversing arm, in combination with the spring lever, or its equivalent, for the purpose of removing the screw from the grippers when released. 12th, The sliding cam, in combination with the threading cam, for the purpose of removing the screw from the grippers and releasing it. 13th, The arm on the threading tool-stock, in combination with the threading tool and rod, or its equivalent, for the purpose of giving the proper form to the thread, and curvilinear shape to the point of the screw. 14th, In combination with the spindles or blank-holders, I claim the gears on the spindles, for the purpose of equalizing their motion and causing them to revolve round the shaft, while changing their position, whether the driving-belt rests or acts on one or both the spindles.

52. LUBRICATING COMPOUNDS; Horace Vaughn, Providence, Rhode Island, and Wm. Hutton, Baltimore, Maryland, Assignors to H. Vaughn, aforesaid.

Claim—"The cooling compound solution," as described.

53. HEMP BRAKES; Allen Wilson and George C. Fletcher, St. Thomas, Missouri.

Claim—The arrangement and combination of the plates, M M′, N N′, O O′, each pair of plates moving in opposite directions through the medium of double cranks upon shafts, I I, as described.

54. SHIP'S HOISTING APPARATUS; D. J. Wilcoxson, Milan, Ohio.

Claim—1st, Arranging the pawl and ratchet so as to allow the hoisting shaft to turn backward in lowering without disconnecting the pawl from the ratchet. 2d, Forming the connexion between a friction pulley and hoisting shaft, by means of a pawl and ratchet, so that the friction pulley is only in connexion with the shaft while lowering. 3d, The combination of the friction pulley, friction brake, and friction lever, arranged so that by the movement of the brake the friction pulley is released to revolve with the shaft, and power of the brake simultaneously applied to the pulley to regulate the velocity of the shaft in lowering. 4th, Combination of the vibrating pawl plates, cam levers, and the eccentrics, arranged as described, to give motion to the hoisting shaft.

55. MANUFACTURE OF HATS; Wm. F. Warburton, Philadelphia, Pennsylvania.

Claim—The process described of perforating the bodies of hats, by means of heated metal points.

56. MOLE PLOUGHS; Augustus Watson, Walnut Run, Ohio.

Claim—Suspending the coulter to the lever and guiding it between rollers, so that it may be raised or lowered independently of the beam or frame of the plough. Also, making one or both of the beam plates adjustable, for the purpose of adjusting the position of the coulter so as to give it the proper tip or inclination. Also, in combination with the beam plates and the coulter, the grooved guide rollers, for the purpose of guiding the coulter in its vertical motion, and preventing any side or twisting motion of the same. Also, in connexion with the coulter and mole, the pivoted tongue, in the manner described. Also, in combination with the coulter and the mole, the link, whose ends are secured by a screw sleeve, for the purpose described.

57. MANUFACTURE OF LINT; Robert D. Dwyer, Assignor to A. B. and Daniel Sands, City of New York.

Claim—Surgeon's lint, produced directly from new flax, in the manner set forth.

58. BENDING PLOUGH HANDLES; John G. Ernst, Assignor to self and S. R. Slaymaker, York, Pennsylvania.

Claim—1st, The employment or use of the form block fitted in the frame with the chain attached, with or without the weight, in connexion with the roller and the toothed segments and stop, the latter being attached to the bed in carriage, arranged as set forth. 2d, The arrangement of the lever connected with clutch, the connecting bar, and the lever attached to shaft, in connexion with the rod and lever or button, whereby the operation of the machine, so far as the gigging back motion is concerned, is rendered automatic throughout. 3d, The movable rack, when adjusted and arranged with the wheel, for the purpose of stopping the feed or forward movement of the carriage.

59. BRICK MOULDS; James A. Hamer, Reading, Assignor to self and Norris Maris, Kimberton, Pennsylvania.

Claim—1st, The combination and arrangement of the operating parts of the brick mould, as described. 2d, The combination of the sides and partitions of the mould, operating as described. 3d, The combination of the levers with the arms and pins, for operating the sides and partitions of the mould, as set forth.

60. SEWING MACHINES; George L. Jencks, Assignor to self, George Kendall, and John Hendrick, Providence, Rhode Island.

Claim—1st, The combination in a single thread sewing machine of a perforated barbed needle, which is arranged obliquely to the feed movement of the cloth or material being sewed, with a pair of nippers, or other equivalent device, which will, as the inclined needle is operating to assist in forming the stitch, retain and present the thread to the needle, in a manner to allow the necessary loop to be formed, shortened, and drawn into or tight on the cloth. 2d, The combination with a barbed needle of the spring nippers, thread-guide, and adjusting nipper-closing bracket, arranged as set forth.

61. CLOTHES-DRYER; Danforth Johnson, Assignor to B. B. Worden and Wm. Cadwell, Chicago, Illinois.

Claim—The employment of flexible braces, in combination with the freely-sliding collar on the spindles, for the purpose specified.

62. BANK LOCKS; Wm. Johnson, Assignor to self and Eibert Schumacher, Milwaukie, Wisconsin.

Claim—1st, Operating the regulator wheels or guard plates by the screw pins, which are susceptible of being changed in the holes of the plates, and in relation to each other, as set forth. 2d, The tapered indicators, stem and beveled plate of the stem, fitting into the tapered recesses, as set forth. 3d, In combination with a series of regulator wheels or guard plates, operated as described, I claim the means for indicating the position of such plates. 4th, The cock-wheel or toothed disc, in combination with the tumbler and the regulator wheels or guard plates, as described.

63. CASTING CHILLED PLATES; Robert Poole, Assignor to self and G. H. Hunt, Baltimore, Maryland.

Claim—Making the chill for casting plates in sections, when said sections are secured to a bed-plate in such a manner as to leave spaces between them, which are filled with sand, or other yielding material, in the manner described.

64. MACHINE FOR WINDING-UP CLOCKS; John B. Powell, Assignor to self and George B. Frick, Philadelphia, Pennsylvania.

Claim—Without confining myself to any specific arrangement of parts, I claim the spring lever, spring

pawl or catch, and ratchet wheel, with the supplementary lever, and permanent pin, or their equivalents, applied in the manner set forth, to the winding-up of clocks, or other machines, in which a spring or weight is used as a prime mover.

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65. APPARATUS FOR HEATING EVAPORATING PANS; H. O. Ames, New Orleans, Louisiana.

Claim—The arrangement of the parallel evaporating pipes with their elbows, and collars, and screw nozzles, passing through the bottom of the pan, and the parallel external supply and escape pipes, with the nozzles and union couplings for making the connexions with the nozzles.

66. SEEDING MACHINES; John Andrews, Clinton, Massachusetts.

Claim—The arrangement and combination of the vibrating bars or blocks, frame, axle, cam, and seed slide, whereby the cam which operates the harrow also moves the seed slide, and the harrow bars have a horizontal vibration, and also a vertical play with the frame upon the axle.

67. SEEDING MACHINES; John Andrews, Clinton, Massachusetts.

Claim—1st, The arrangement and combination of the blocks, circular plates, teeth, levers, and seed sliders, as described. 2d, The arrangement and combination of the covering apron, bar, blocks, rod, and lever.

68. BRAKES FOR RAILROAD CARS; Francis Armstrong, New Orleans, Louisiana.

Claim—Making the adjustment from the pull or the coupling, when actuating on distinctly detached parts, namely, the latch and tongues. Also, in combination, the arms, bar, and levers, arranged as described.

69. MACHINERY TO FEED SHEETS OF PAPER TO PRINTING PRESSES; Moses S. Beach, Brooklyn, New York.

Claim—1st, Feeding sheets to the impression cylinders of printing presses, by means of revolving arms or scrapers, operating in combination with rollers, in the manner described. 2d, Retaining the paper in connexion with the impression cylinders of printing presses during the process of printing, by means of holders, in the manner described. 3d, Detaching the paper from the impression cylinders, by means of deflectors, as described.

70. COTTON CULTIVATORS; G. W. Beard, Canton, Mississippi.

Claim—The peculiar shape given to the scrapers or cutters, and their lateral and vertical adjustment, in combination with the adjustable plough beams, arranged in the manner set forth.

71. COTTON SEED PLANTERS; E. P. Beauchamp, Preston, Georgia.

Claim—The arrangement of the box, axle, wheels, side-pieces or frame, bolt, beam, stock, follower, furrow opener, and brace, as described.

72. SHINGLE MACHINE; Laurent Beaudreau, Fond du Lac, Wisconsin.

Claim—The relative arrangement, for united operation, of the intermediate circular revolving saw, open reciprocating double carriage, toothed clamps, bars, rollers, springs, inclined or curved guiding plates, horizontal rocking cradles, cams, shafts, bars, and hinged flaps or pawls, in the manner described.

73. WATCH CASES; Philip Bettle, London, England; patented in England, November 18, 1857.

Claim—1st, The attachment of the inner case containing the movement of the outer case, by means of pins or pivots, so that the movement case can be turned over, to face the open or closed side of the outer case, without being removed from the outer case. 2d, Attaching the pendant handle to the movement case, so that it forms one of the centres or pivots, on which the watch turns, in connexion and combination with a pin or pivot on the opposite side of the case. 3d, The particular form and manner of constructing the pendant, and attaching the same to the inner or movement case before described.

74. FISHING REEL; William Billinghurst, Rochester, New York.

Claim—The combination of the skeleton ring with the other parts of the reel, arranged in the manner set forth.

75. COMPOSTS; Edmond Blanchard, Greenfield Mills, Maryland.

Claim—A fertilizing compost, composed of lime, chloride of sodium, wood ashes, charcoal, wheat bran, chimney soot, and gypsum, combined in the proportion and manner described.

76. MACHINES FOR CUTTING PAPER; E. Burroughs, Rochester, New York.

Claim—1st, The employment or use of the reciprocating and oscillating knife, arranged to operate as set forth. 2d, The knife, in connexion with the cone of pulleys attached to the shaft, s, the hollow shafts with their respective gearing, and the shaft, R, with its gearing, and the racks attached to the knife-bar by the rods, arranged as set forth. 3d, The arrangement of the shaft, U, with spring, the arm, cone of pulleys, levers, rack, for the purpose of automatically changing the movement of the knife from a descending to an upward movement. 4th, The clamp formed of the vertical and horizontal plates, arranged so as to be adjusted by the screw and pinion or worm-wheel, pinions, and racks, the latter serving in the capacity of both racks and guides. 5th, Attaching to the shaft, F, an index, arranged to move over a graduated stationary plate, attached to the frame, for the purpose of enabling the operator to accurately adjust the paper beneath the knife.

77. ADDING MACHINE; J. T. Campbell, Rockville, Indiana.

Claim—The arrangement of a series of wheels provided with ten cogs or teeth, and carrying the ten numeric figures on their outward faces, in combination with the stationary plate containing like numeric figures, arranged on the circle, surrounding each of the wheels in the series. And in combination with the parts above claimed, arranged as described, I claim the stop-bars, and spring slides, and oscillating arms or pawls with the cam, arranged for joint operation as set forth.

78. SEED PLANTERS; Walter Clark, Palmyra, Illinois.

Claim—The arrangement of the reciprocating agitating rod, when passing through the adjustable seed discharge opening in the side of the hopper, with the frame, wheels, pins, teeth, hopper, and adjustable slide, constructed as set forth.

79. CORN HARVESTERS; W. Cogswell and C. A. Mathewson, Ottawa, Illinois.

Claim—The circular cutter and the reciprocating sickle, with its stationary toothed plate, in connexion with movable bed, or fingers, the whole being placed on a mounted frame, and arranged as set forth.

80. CORN PLANTERS; J. P. Coonley, Farmington, Michigan.

Claim—The arrangement of seeding roller, gear wheels, slide plate, lever, adjustable teeth, coverers, and tracking gauge, constructed as set forth.

81. CORN HARVESTERS; B. T. Currier, Bath, Maine.

Claim—The arrangement and combination of the scythe-shaped cutters, rods, cranks, adjustable frame, and standards, as described.

82. HOOP FASTENINGS FOR COTTON BALES; Edward Davidson, Batesville, Arkansas.

Claim—Forming the socket of two parts to admit of the same being opened to receive the bent or doubled and lapped ends of the bale hoop, and closed to secure the ends of the hoop together.

83. VULCANIZED GUMS; Alva G. DeWolfe, Seymour, Connecticut.

Claim—The use of pulverized, vulcanized rubber, gutta percha, or other vulcanized gum, in the manner specified.

84. CENTRIFUGAL GUN; C. S. Dickinson, Cleveland, Ohio.

Claim—1st. The employment of a lever provided with a collar which surrounds the shaft, pivoted or hinged, and provided with a pin or rod, as specified. 2d, Operating the lever in one direction, by means of rod and its connexions through the centre of the shaft, and in the other direction by means of spring, for the purpose of discharging the balls from the barrel at the proper time.

85. SEATS FOR SLEEPING CARS; Rudolph Dirks, Philadelphia, Pennsylvania.

Claim—1st. The cushioned platform and the frame, F, with its detachable cushion and movable legs, in combination with the permanent partitions, the said platform and frame being hinged together, and otherwise arranged as set forth. 2d. The boards, G and K, adapted to and sliding in or against the partitions, and arranged so as to form the foot and head-boards for the couches. 3d. The frame, H, as hinged to the side of the car, and the frame, I, so hinged to the frame, H, that both frames may assume the positions illustrated in figs. 1 and 2, in combination with the partitions and their sliding frames, G. 4th. Forming the upper couch of the board, L, hinged to the side of the car, and one or more boards, M, hinged to the board, L, when arranged in combination with the permanent partitions.

86. HEMP-BRAKES; Zachariah Feagan, Palmyra, Missouri.

Claim—The arrangement and combination of the stationary bars, finger guards, vibrating spring levers, and cams, constructed in the manner set forth.

87. PRINTING PRESSES; Andrew Dougherty, Brooklyn, New York.

Claim—The combination of the inking apparatus at the side of the main cylinder of a press, with a carriage that can be moved from and towards the main cylinder, and with a stop that controls the position of the carriage.

88. DIE FOR SWAGING BOLT-HEADS; Albert Eames, Bridgeport, Connecticut.

Claim—Making dies for swaging bolt-heads, and other articles, in two or more parts, the parts forming the bottom being fitted to and in the part forming the periphery, and the whole fitted to and secured within the drop, or equivalent therefor. Also, in combination with the die, the bottom of which is made separate from, and inserted in, the part forming the periphery, grooving the periphery of the part forming the bottom for the escape of air.

89. SEWING MACHINES; J. P. Emswiler, Knight's Tower, Indiana.

Claim—The combination of the slide, or its equivalent, with the feeding mechanism, for the purpose of adjusting the bed to the feeding mechanism for materials of various thicknesses, without changing the position of the feeding mechanism. Also, in combination with the bobbin, arranged to vibrate on the shuttle, the longitudinal arched pressure spring.

90. WINDLASSES; Moses G. Farmer, Salem, Massachusetts.

Claim—The combination of the roller, the ratchet wheel, B, the retaining ratchet, and the actuating ratchet, with the lever and toggle-joint, E, so arranged that the thrusting power of the toggle-joint shall be wholly exhausted when the lever is fully depressed, and the joint, E, brought into a straight line which intersects the axis, and the point of the actuating ratchet which is in contact with a tooth of the wheel, B. Also, the means described of permitting the backward motion of the roller, viz: by causing the motion of the lever to release, alternately, the actuating and retaining ratchets through the agency of such means as the springs, the projecting arms, and the proper position of the collar.

91. SEWING MACHINES; C. N. Farr, Philadelphia, Pennsylvania.

Claim—The arrangement of the fulcrum slide, stops, and looping bar, for regulating and adjusting the motions of the looper. And, in combination with said looping bar, adjusted as described, I claim the rocking lever, fitting and acting as specified.

92. GOVERNOR VALVES; Benaiah Fitts, Worcester, Massachusetts.

Claim—The manner of mounting the valve, that is to say, resting or supporting the valve, as shown at M, and retaining it into its seat, as shown at N, for the purposes set forth.

93. CULTIVATORS; Perley F. Freeland, Newark, Assignor to V. R. David, Morris, Illinois.

Claim—The arrangement of the tongue, curved or segment bar, beams with screw-rod, and pendants and shares, attached as set forth.

94. APPARATUS FOR FOLDING OR WRAPPING PAPERS; Edwin Gomez, City of New York.

Claim—The folders, formed with the lips and volutes, in combination with the intermediate twisters, in the manner specified.

95. PRINTING PRESSES; George P. Gordon and F. O. Degener, City of New York.

Claim—1st. Combining with the tympan frame the sheet-holding and relieving nippers or grippers, for the purpose of holding the sheet and for relieving the sheet from the type. 2d. The combination of a cylinder, or segment of a cylinder, with its wheel-bearers, the impression cylinder, roller pendants, and the racks or gearing. 3d. The frictionless roller, or its equivalent, in combination with the tympan frame, for the purpose of closing the tympan and properly laying the sheet upon the form in advance of the passage of the impression cylinder, or its equivalent. 4th. Operating the sheet-holding and relieving grippers by or through the motion of the tympan. 5th. Attaching a tympan frame to an adjustable bed in such a manner that they, at all times, shall retain their relative positions towards each other. 6th. Hanging, hinging, or attaching the inking apparatus to the frame of the press, or to the press, in such a manner that it may be turned, swung, or set aside, so as to allow the workmen to get at the form to make any necessary alterations, or to make the form ready, or for the purpose of using the bed as a composing stone.

96. FIRE-BOXES FOR LOCOMOTIVE ENGINES; Ralph Greenwood, Altoona, Pennsylvania.

Claim—The midfeather, when used in connexion with a gas chamber and fire-box, provided with open-

ings, the parts being arranged relatively with each other to operate as set forth. Further, the cylinders, when applied to the orifices of the gas chamber and fire-box, and connected by a lever to operate simultaneously, as set forth.

97. POTATO-DIGGERS; Leonard B. Griswold, Pennfield, New York.

Claim—The employment of a rotating head or disc, having teeth or spurs arranged around an upright shaft in a direction oblique to the axis thereof, in combination with the truck and driving wheels, or their equivalents, for giving the required motion.

98. SEED PLANTERS; W. D. Harrah and B. S. Baldwin, Davenport, Iowa.

Claim—1st, The combination and arrangement of the peculiarly constructed hopper, regulating plate, sliding frame, slides, pitmans, edged leading wheels, hinged seed tubes, grooved covering wheels, foot lever, caster wheel, and hand lever, as described. 2d, In combination with the hopper, the arrangement of the foot lever and hinged bar, when the latter is so hinged as to throw the points of the seed tube forward in their adjustment, or when the foot lever is depressed.

99. WATER-GAUGE FOR STEAM BOILERS; Robert S. Harris, Galena, Illinois.

Claim—The within specified manner of constructing and attaching the float stem to the boiler, whereby it is made to answer for carrying the float and as an index for indicating the height of the water in the boiler, and, if desirable, as a trip for opening a valve for an alarm whistle.

100. SEWING MACHINES; James Harrison, Jr., City of New York.

Claim—1st, The switching lever, constructed and operated as set forth, for directing the thread to the beard or barb of the needle, and preventing the escape of the thread therefrom. 2d, Controlling the feed and the stitch by the raising or lowering of the needle. 3d, Rotating the needle and carrying with it the thread, thus forming a twisted threaded-loop, as described.

101. MACHINE FOR CUTTING OUT WOODEN-WARE; George A. Hay, Berea, Ohio.

Claim—The rock shaft, in combination with the hoop-saw, arranged as described, and operated by means of the pinion, in the manner set forth.

102. WOOD-SAW FRAME; James Haynes, Hollis, Maine.

Claim—The inclined plane, ratchet, and the nipper or strainer, applied to the saw and frame, as described.

103. MODE OF GENERATING AND APPLYING ELECTRIC CURRENTS IN TELEGRAPHING; Stanislas Hoga, Wm. P. Piggott, and Septimus Beardmore, Middlesex Co., England.

Claim—The application to telegraphic instruments of currents of electricity, produced from metals or substances arranged in the earth, or in natural bodies of water, in the manner and for the properties and relations described.

104. STEAM BOILERS; Robert Hooper, Baltimore, Maryland.

Claim—1st, Contracting that part of the boiler immediately above the fire-flues, in combination with the widening and extending of that part which is beyond or in the rear and above the end of the fire-box, as set forth. 2d, Forming a water-circulating passage below, in rear, and above the fire-box, and nearly or wholly isolating said passage from the fire-box, by means of a large space existing between the fire-box and the partition walls of the said water-circulating passage, as set forth.

105. APPROACH-OPENING GATE; Anthony Iske, Lancaster, and Jacob B. Erb, Conestoga Township, Penna.

Claim—The arrangement of the platforms and uprights to the lever, with the connecting rod attached to the arm on the slat, the groove on the inside of the post, for operating a series of cross slats connected by pivots with the slats, combined in the manner set forth.

106. MACHINES FOR MILKING COWS; John W. Kingman, Dover, New Hampshire.

Claim—The teat-cups or tubes, partially covered at their upper ends with an elastic flanch, which will yield for the insertion of the teat, and gripe it so as to hold the cup upon the teat during the process of milking, and form a packing between the edge of the cup and the teat, which will be pressed against the teat by the external air when the internal air is exhausted; and, in combination with the device above claimed, I claim a vessel provided with an air-pump, and connected with said cup or cups by flexible tubes, so arranged as to exhaust the air and draw the milk from the cow, or other animal.

107. RAILROAD CAR WHEELS; Ebenezer A. Lester, Boston, Massachusetts.

Claim—Attaching the wheel to its axle by means of the auxiliary hub with its recesses and groove, and the segmental ring, or its equivalent, connected with the wheel, in the manner set forth.

108. SELF-ACTING BATTERY FOR SCARING CROWS, &c.; Theodore Lipshuts and Daniel C. Jones, Ballston Spa, N. Y.

Claim—The rising and falling box, arranged with the slide and apertures, and operating in combination with the dog and pulley, in the manner specified.

[The object of this invention is to arrange a battery with a number of chambers, in connexion with a gun barrel, in such a manner that its chambers, one after another, are made to go off at regular intervals without the aid of man, and, by these reports, frighten away injurious animals, and the invention consists in arranging a rising and falling box in such relation to a revolving battery, that when the box is filled with sand it sinks down and causes a hammer to discharge one of the chambers of the battery, and the box is so arranged that it discharges the sand when it reaches the ground, and it is raised by weights ready for a new charge.]

109. MACHINES FOR MILKING COWS; Samuel W. Lowe, Philadelphia, Pennsylvania.

Claim—The cup with the perforated diaphragm, constructed to receive all the teats of the cow's bag, by having an opening in the diaphragm for each teat, and combined with an exhausting apparatus, constructed as described.

110. DEVICE FOR MAKING ELECTRO-MAGNETIC CURRENTS CONSTANT OR INTERMITTENT; Moses Marshall, Lowell, Massachusetts.

Claim—The spring, so constructed and arranged as to be insulated from, or connected to, the two ends of the helical wire by springs, or otherwise, essentially in the manner set forth.

111. KITCHEN SAFE; W. McElwee, Shelbyville, Indiana.

Claim—The combination and arrangement of hollow posts with water cups, arranged in the manner specified.

[The body of this safe is mounted on hollow posts, extending from the floor to the top of the safe, and

they are provided with water cups near the bottom of each leg, which are connected by perforations with the compartments of the safe, so that cool air is always supplied to the safe without making perforations in its sides.]

112. SEEDING MACHINES; E. McKenney, Montgomery, Ohio.

Claim—The arrangement and combination of the distributing discs, levers, check valves, and buttons, to operate together with the hammer and with the bell, as set forth.

113. SEED PLANTERS; J. B. McMillan, Tipton, Indiana.

Claim—The planting and covering apparatus, when constructed and arranged in the manner set forth.

114. UNDERGROUND DRAINING MACHINE; Adam Miller, Mt. Pleasant, Iowa.

Claim—The combination and arrangement of the mole with the drain protectors, for the purpose of expeditiously and economically giving protection to the upper part of the ditch, and of disengaging the protectors from the mole plough with facility after they are laid.

115. DRIVERS FOR MILL-STONES; Alex. Miller, Newbern, North Carolina.

Claim—The employment or use of the friction rollers applied to the driver, in connexion with the plates, or their equivalents, fitted in the recesses adjoining the eye of the stone or runner, for the purpose of forming proper bearing surfaces for the rollers, the whole being arranged substantially as and for the purpose set forth.

116. HOOPS FOR SKELETON SKIRTS; Samuel C. Moore, Providence, Rhode Island.

Claim—The corrugated sheet metal hoop for ladies' skirts described.

117. DEVICES FOR HOLDING TOGETHER THE PANELS OF PORTABLE FENCES; Oliver P. Moran, Haynesville, Mo.

Claim—The arrangement of the notched projections or projecting pieces of the upper and lower rails, in combination with the right-angled notches in the end battens, in the manner specified.

118. CULTIVATORS; Samuel Mowry, Womelsdorf, Pennsylvania.

Claim—The arrangement of the axles, wheels, B, stretch-bars, levers, frames, wheel, C, ratchet bar, and cultivator bar, constructed as described.

119. HYDRO-CARBON VAPOR APPARATUS; A. A. Moss, Philadelphia, Pennsylvania.

Claim—The steam generator and dryer, in combination with a distinct hydro-carbon vaporizer, the same being also connected with the retort, and the whole arranged together so as to generate the steam and hydro-carbon vapor separately, and for their subsequently mingling and combination.

120. CORN PLANTERS; Matthew Mitchell, Alton, Illinois.

Claim—The arrangement of the frame, seats, hoppers, shoes, and cutters, with the device for operating them, in combination with the frame hung on the axle, and with the slides, operated as described.

121. ARRANGEMENT OF DEAD-BEAT ESCAPEMENT; Don J. Mozart, Yellow Springs, Ohio.

Claim—The improved arrangement of the double "scrapers" with the star scape-wheel, or its equivalent, as specified.

122. SKATES; Edward Norton, Boston, Massachusetts.

Claim—The metal straps, and the slotted plates and screw for tightening the skate to the foot.

[This invention consists in making the sole-plate, or what is more generally called the stock of the skate, of metal, and in two detached parts, and in pivoting them respectively to the heel and front parts of the runner, and in connexion with a skate thus made, in making the heel and toe straps for securing the skate to the foot of sheet metal, which are secured tightly to the foot by a peculiar fastening.]

123. POST-MARKING STAMPS; Marcus P. Norton, Troy, New York.

Claim—The blotter, connected or attached to the main part of any "post-office post-marking stamp," for the purpose of cutting and inking, blotting and effacing, so as to successfully cancel the frank or postage stamp of any letter or any package, at the same time and operation of marking upon such letter or package the name of any post-office, the year, the month, and the day of the month.

124. CULTIVATORS; Leonard Packard, Galesburg, Illinois.

Claim—The arrangement of the beams, the irons, and the projection on the ends of the beams, the adjustable arms, braces, blades, lifting rods, adjusting bar, levers, fulcrum, and hinged pole, as described.

125. EGG-BEATER OR CHURN; J. J. Parker, Marietta, Ohio.

Claim—The tube, in combination with the band and grated bottom, arranged in the manner described.

126. CLOTHES-FRAME; Horace Parkhurst, DeKalb, Illinois.

Claim—The combination and arrangement of the standards, the rails, the head-blocks, the clasps, the cords, as specified.

127. MODE OF UNITING SOLID SUBSTANCES; Dubois D. Parmelee, City of New York, Assignor to J. A. Greene, Beverly, Massachusetts.

Claim—The method and process described of uniting various substances or bodies of the same or different character and properties, by the interposition between the surfaces of said substances or bodies to be united, of one or more sheets or layers of india rubber and gutta percha, separately, or when combined with the substances, such sheets or layers having previously been treated in the manner described, to produce the change specified—whereby, on completion of said change, a water-proof cement is obtained, which, while it possesses the requisite rigidity and coherence to keep the bodies firmly and strongly united, possesses a sufficient degree of elasticity to compensate for the expansion or contraction of the fibres of the bodies, for the purposes set forth.

128. CORN PLANTERS; Lawson G. Peel, Webster County, Georgia.

Claim—The arrangement of the beam, stock, frame, bolt, hopper, wheel, and cylinder, as described.

129. FILING COTTON-GIN SAWS; Colwell P. Pool, New Market, Alabama.

Claim—The arrangement of the file-case with the file-holder and sleeves, to operate in combination with the bar, and with the slide and ridge, in the manner specified.

130. SEWING MACHINES; William F. Pratt, Bristol, Pennsylvania.

Claim—The construction of the thread-case with an angular projection extending across its centre, and the construction of the slide ring, or its equivalent, with a similar angular projection fitting to the said

projection, and operating in combination therewith in the manner specified, not only to prevent the twining of the thread-case, but to check and control the loops in their passage over said case, thereby avoiding the use of separate thread-controlling apparatus.

131. FURNACE FOR MAKING IRON DIRECT FROM THE ORE; S. M. Quimby, A. H. Brown, G. H. Renton, and James Criswell, Newark, New Jersey.

Claim—The arch, the hopper-damper, the rods or bars, arranged as described. Also, the dampers at the bottom of the tubes, for discharging one or more tubes at the same time into one box or hopper.

132. APPARATUS FOR TANNING; John B. Read, Cold Spring, New York.

Claim—An improved apparatus for tanning and other purposes, said apparatus consisting of one or a number of smooth, porous, or perforated surfaces of wood, or other fixed material, placed singly or in succession in open or closed vats or vessels, or arranged in pairs so as to form closed hollow cases, upon which skins, or other substances to be operated upon, are to be smoothly stretched, and then the tannin or other fluids forced through them by hydrostatic or other pressure into the interior, whence means of escape are provided, as described. Also, the use of tarpaulin sheet metal, or other water-proof substances, in form of sheets, to cover over the perforated parts of the cases not overlaid by the skins, &c., that the fluids used may be afforded no passage except by percolating through the skins.

133. GAS RETORTS; Charles A. Robbe, Augusta, Georgia.

Claim—A gas generating chamber of a retort, made in two parts, when the said parts are constructed so as to lock together and form a tight joint by the simple act of sliding one portion into gear with the other.

134. SEED PLANTERS; Theodore B. Rogers, Wethersfield, Connecticut.

Claim—The arrangement of slides, lever, former, floats, adjustable pins, and markers, as described.

135. CULTIVATORS; James Rue, Englishtown, New Jersey.

Claim—The arrangement of the loose draft pole, bracket, cultivator frame, hinged rods, devices, bracket, and pin, arranged in the manner described.

[The invention consists in attaching the draft pole to the beams by means of hinged rods, which connect with the pole at a point above the pin, to which the draft animals are hitched, so that any strain exerted on that pin has a tendency to depress the rear end of the draft pole and to raise its front end, whereby the ploughshares are kept down to the ground without any extra exertion of either driver or animals, and as the pole is connected by hinged rods without any rigid fastening, the driver is enabled to accommodate the action of the shares to the inequalities of the ground, and at the same time the front ends of the shares can be raised and the cultivator drawn from place to place.]

136. SEATS AND COUCHES FOR RAILROAD CARS; Ezra D. Sargent, Indianapolis, Indiana.

Claim—1st, The side lounge or nurse couch, arranged as set forth. 2d, Its combination with the backs, seats, partitions, brackets, and stops, arranged as set forth.

137. GRINDING-CYLINDERS FOR APPLE-MILLS; John Shæfer, Lancaster, Pennsylvania.

Claim—The tangential, curved, longitudinal, toothed cylinders, as set forth.

138. NAIL-PLATE FEEDERS; John P. Sherwood, Fort Edward, New York.

Claim—The employment of the stationary inclined plane and the tumbler, having an inclined face, in combination with the arms of the hollow shaft of the plate-holder, and with the feed-screw and nut, and the driving cam, or their equivalent, operating together, as described.

139. APPARATUS FOR HEATING EVAPORATING PANS; Evan Skelly, Plaquemine, Louisiana.

Claim—The employment, in an evaporating pan, of a conical steam heater, with a central opening and a passage around its exterior and under its bottom.

140. SECURING ARTIFICIAL TEETH; N. B. Slayton, Madison, Indiana.

Claim—1st, Securing artificial teeth on plates of gold or silver, by means of an amalgam of gold or silver, or both, combined with mercury, as described. 2d, Forming, by means of said amalgam, an outer flanch or rim, covering and supporting the base of the teeth, as set forth.

141. STRAW-CUTTERS; Solomon P. Smith, Crescent, New York.

Claim—The arrangement of a crank shaft, pitman, knee-jointed lever, knife, with a straw box and cutter block, for conjoint use.

142. MORTISING MACHINE; Abel Spencer, Jr., Southport, New York.

Claim—The frame made with cross-heads connected together by means of the jointed rods, and having those rods jointed at or nearly in line with the cutting edge of the chisel, and the mode of applying or using it, or any other manner substantially the same.

143. TENONING BLIND SLATS; La Fayette Stevens, Elmira, New York.

Claim—Constructing the cutter-head with grooved cheeks, clamping nuts, and bearing studs, whereby the plane cutter knives are held in an oblique position with the plane of rotation with the cutting edge of the operating one, terminating in conjunction with that of the hollow hub and shoulder, arranged as set forth. Also, the combination and arrangement of the rest with stationary and movable upper and lower jaws and gauge, in the manner described. Further, the arrangement of devices for gauging the length of the slat, consisting of the automatic stop bolt, as operated by inclined plane and lever, to cause the carriage to stop alternately at the fixed stop-gauges.

144. BURGLARS ALARM; Stephen Stewart, Philadelphia, Pennsylvania.

Claim—The combination of the several parts, arranged to operate as set forth.

145. WASHING MACHINE; Wm. A. Suddith and John F. Suddith, Charlestown, Virginia.

Claim—The hinged part of cylinder, as set forth.

146. SEWING MACHINES; George S. Tapley, Bristol, Connecticut.

Claim—The movable cup and its appendages, for griping and automatically releasing the shuttle at intervals, as specified. Also, the construction and arrangement of the feed apparatus, set forth.

147. MACHINES FOR WASHING AND SEPARATING ORES AFTER BEING PULVERIZED; Horace Trumbull, Jersey City, New Jersey.

Claim—The application to a rotary buddle or table, such as described, of vibrating brushes, when the same are arranged and operated as specified.

148. Elevators or Hoisting Apparatus for Hotels, &c.; Otis Tufts, Boston, Massachusetts.

Claim—1st, For the purposes of elevating, the combination of the screw and the passenger car or platform. 2d, The construction of a screw for elevating, having stays or bearers at intervals, attached to the wall of a building or any fixed adjacent structure. 3d, The construction of a nut with the slot or opening in the back or side to enable it to pass by the bearings or stays before referred to, and as described. 4th, Constructing a nut or carriage with wheels or rollers running upon the thread of the screw, as described. 5th, Controlling the descending motion of elevators or hoisting apparatus by means of fluid retarders, constructed as described. 6th, Regulating the action of fluid retarders by means of a fly-ball governor, or its equivalents. 7th, The construction, arrangement, and operation of passenger cars of an elevator or hoisting apparatus, as described: that is, providing the platform with side walls and doors or gates, said doors or gates being combined with suitable mechanism arranged in relation to stationary cams or projections on the gallery floors, or any contiguous parts of the building, so as to open and close automatically, in the manner set forth. 8th, Opening and closing the doors of the galleries or landings automatically, by means of cams or projections on the car, through a system of compound or multiplying levers, arranged as described. 9th, Fastening and unfastening automatically the doors or gates of the car, by spring latches, or their equivalents, operated by cams or projections upon the gallery floors or adjacent walls of the building. 10th, Fastening and unfastening automatically the doors or gates of the galleries or landings by spring latches, or their equivalents, operated by cams or projections upon the car. 11th, The arrester, in combination with the fluid retarders, for the objects and purposes set forth. 12th, Passing the shipping rods and the cord or rod that operates the friction brake through the car or platform, for the purposes set forth.

149. Dumping Wagons; William B. Twiford, Chincoteauque, Virginia.

Claim—The three-sided, four-wheel, open frame, stationary crank axle, and long wagon body, arranged in the manner described.

150. Spring Bed-bottom; Felix Tylee, Cleveland, Ohio.

Claim—1st, The central support, constructed in the manner described. 2d, The combination and arrangement of upper slat, pin, supports, with central support, spring, and blocks, arranged as described.

151. Machinery for Sowing Fertilizers; Lorenzo Tyler, Havana, New York.

Claim—The arrangement of the frame, hopper, partition, adjustable slide, M, valve, cylinder, concave, adjustable slide, *s*, and flexible clasps, constructed as set forth.

152. Hose Coupling; George H. Van Vleck and Horace Tupper, Buffalo, New York.

Claim—The arrangement on the thimble of the head with two or more screw threads, having its upper end turned down, as described, and being provided with a projecting rim, to operate in combination with the thimble and with the nut.

153. Cultivators; Amsey Warren, Westport, Connecticut.

Claim—The parting or deflecting bar, hoes or shares, and rake, when applied to a suitable frame provided with wheels, arranged and combined to operate as set forth.

154. Knitting Machines; J. F. Waterhouse, Germantown, Pennsylvania.

Claim—1st, The application of a drum, or its equivalent, with detachable pegs, to operate a series of independent thread guides having independent springs. 2d, The striker, or its equivalent, arranged in respect to the thread guides, and operating so as to control such of the thread guides as are not under the control of any of the pegs in the drum. 3d, Moving the pegged drum, or its equivalent, at intervals first in one direction and then in another, by means of the revolving disc, and its two inclined projections, in combination with the ratchet wheel. 4th, Imparting a combined lateral and vertical reciprocating motion to the needle bars by means of the devices described.

155. Machine for Receiving and Piling Paper; J. A. Wilkinson, Brooklyn, New York.

Claim—1st, The accelerating bands and roller, arranged to project the sheets of paper successively over each other as they subside in the air, and in combination with the foregoing parts, I claim the endless apron receiving such sheets. 2d, The retarding bands, in combination with the delivering bands, for the purposes specified.

156. Rotary Presses; J. A. Wilkinson, Brooklyn, New York.

Claim—1st, The curved demi-grab with the sliding clamp and lip, for the purposes specified. 2d, The curved compositors' shield, for the purposes specified. 3d, The arrangement of the proof cylinder and rollers for inking the type on the proof cylinder. 4th, The plate and roller, for giving pressure in taking a proof from the types on the cylinder. 5th, The horizontal gudgeon and binding screw to secure the proof cylinder, and facilitate the correcting of the types. 6th, The movable clamping segments at the heads of the type or proof cylinder to secure the types in place, and also allow for the removal of portions thereof. 7th, Revolving the type cylinders in a trough containing alkaline, or other suitable solution for washing the types. 8th, The apron for leading the paper into the press, and on which said paper lies while receiving the first impression against the cylinder, thereby said feeding apron becomes also the tympan sheet. 9th, A curved arch or bridge, over which the paper or fibrous material passes, to give direction thereto and prevent buckling or twisting. 10th, Corrugating or forming ribs on said curved bridge in diverging lines, so as to spread the paper widthways, as the same passes over the bridge. 11th, The auxiliary frame hinged into the main frame, and carrying the upper inking apparatus, by the elevating of which both type cylinders are exposed to view or can be lifted out of their place for varying the composition, or otherwise. 12th, The manner specified of throwing off both impressions by raising the auxiliary frame and lowering the impression roller. 13th, In a rotary printing press an endless tympan sheet, let off a sufficient distance, and so fitted that the offset from the ink of the first impression does not again reach the paper until removed or sufficiently dry, so as not to produce blurring or offset on the paper. 14th, The arrangement of the ink rollers, $1' 1'' 1''' 1''''$, in the manner and for the purposes set forth, whereby the rollers, $1' 1''$, act to supply the required amount of ink to the rollers, $1''' 1''''$, that supply and work the ink on the cylinder, 1 or $1'$. 15th, The arrangement of the ink rollers, $1'$, and workers, in their adjustable bearings.

157. Stump Extractors; Eri Wills, Augusta, Maine.

Claim—The combination of the frame, tongue, and shaft, with the wheels, ratchet device, levers, and chain, arranged as set forth.

158. Roofs for Railroad Cars; A. P. Winslow, Cleveland, Ohio.

Claim—The plates, caps, and grooved rafters, arranged as described.

159. PREPARATION OF GLYCERINE; J. F. Wisnewski, Cincinnati, Ohio.

Claim—The employment or use and introduction of the within named chemicals, in the relative quantities, manner, and combination described.

160. SKELETON SKIRTS; Edward F. Woodward, Brooklyn, New York.

Claim—The sectional extension skirt, combined and attached to the circular skirt, the whole being arranged in the manner set forth.

161. COMPOSITION OF MATTER FOR ORNAMENTAL PURPOSES; Albert H. Wright, Camden, New Jersey.

Claim—The composition of the matter described, consisting of the clay and sulphur with the emery, or its substitute, combined together as described.

162. MACHINE FOR PRINTING IN DIFFERENT COLORS; John K. Wright, Philadelphia, Pennsylvania.

Claim—Hanging the rollers for printing separate colors and patterns on separate frames, and arranging the said frames so that they may be adjusted independently of each other on the rails.

163. REVOLVING STAIRS; Nathan Ames, Saugus, Mass., Assignor to self and Ward McLean, City of N. York.

Claim—1st, Arranging steps or stairs upon an endless belt, or in any manner equivalent, and placing them over rollers so as to form a revolving flight of stairs, which may be used both as a common flight and as an elevator. 2d, The triangular arrangement of the stairs, whereby an endless flight is made to pass around three rollers. 3d, The double parallel arrangement, whereby ascending and descending flights are placed side by side. 4th, The use of auxiliary stationary steps or stairs, to operate in connexion with the revolving stairs. 5th, The employment or use of rods or slots, to operate in connexion with the slotted stairs.

164. CONSTRUCTION OF LIGHTNING-RODS; L. S. Baldwin and Lucius Parks, Assignors to L. S. Baldwin, aforesaid, Leroy, New York.

Claim—The employment of a quadrangular tube of sheet metal with spiral-fluted sides, in combination with the straight central supporting rod.

165. SEWING MACHINES; R. Eickemeyer, Assignor to self and E. Underhill, Yonkers, New York.

Claim—1st, The combination of the angular supporting plate, with a needle applied and arranged to work through an opening in the angle of the said plate, and obliquely to both faces of the said plate, for the purpose of sewing obliquely through any substance supported in the angle of said plate. 2d, The combination of the angular supporting plate, the obliquely arranged needle, and a looper, applied and operating so as in its movements to follow the angle of said plate. 3d, The combination of the looper, constructed with a two-pronged hook, and having a triple movement with a stationary guide, applied and arranged relatively to the needle and angular supporting plate. 4th, The arrangement of the feeding dog and presser in a swinging frame, so applied, in combination with the angular supporting plate, as to provide for the introduction and removal of the hats to and from the machine. 5th, The slide, fitted to the angular plate opposite the feeding dog, with its face recessed behind the general surface of the plate, and having applied to it a spring by which it is operated, in combination with the feeding dog. 6th, The plate, 26, and its lips, in combination with the plate, F.

166. PORTABLE CAPSTAN AND CRABS; Asahel Elmer, Assignor to Nathan Elmer and R. M. Pritchard, Shabbona Grove, Illinois.

Claim—So combining with the truck wheels or ground supports a capstan and crab, and a flexible rigging, as that the power of the team that draws the apparatus and works the capstan may be used for setting or anchoring the said crab and capstan, as well as to raise it up, reload it on to the truck, and transport it from place to place.

167. BOMB LANCES; Isaac Goodspeed, Norwich, Connecticut, Assignor to self and Geo. A. Mansfield, Boston, Massachusetts.

Claim—1st, The compound wing described, consisting of the wing proper, the lever, and the pin and slot, arranged as set forth. 2d, The construction of a projectile having a prismatic shank with guiding wings of copper, or any thin substance, fixed to the exterior surfaces of the prism in such a manner as to expand in coincident plates.

168. RAILROAD STATION INDICATOR; Louis Koch, Assignor to self and H. Forstrick, City of New York.

Claim—The apron or band, with the names of the streets or stations on the line of the route marked thereon, attached to and working on rollers or a revolving plate, or stationary plate and revolving index, when said apron, plate, or index are operated from the running gear of the car by suitable mechanism to give the same a continuous movement, and simultaneous with that of the car.

169. DOUBLE CLASP-HOOK FOR WATCH-CHAINS, &c.; Morris Pollak, Assignor to Morris Talkenan, Morris Pollak, and Solomon Weiner, Hoboken, New Jersey.

Claim—The S-shape or double clasp hook, formed by the discs and clasp-jaws on the centre pin that passes through the middle of the bent piece.

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Joule's Unit Verified. By J. P. ESPY.

If we imagine an air-tight piston to move without friction in a cylinder 780 feet long, containing 780 cubic feet of air, at the temperature of zero, of half atmospheric density, to be condensed into half the space by a force of $7{\cdot}5 \times 144$ lbs., falling 390 feet, that is, through half the length of the cylinder, the air, by my experiments with the

double nephelescope, will be heated 76°. As this is effected by a weight of $7{\cdot}5 \times 144$ lbs., falling 390 feet, and as the air heated weighs 31·25 lbs., it may be used to test Joule's unit.

$7{\cdot}5 \times 144 \times 390$ is equal to the mechanical power of 421,200, which heats 31·25 lbs. 76°; therefore, to heat one pound will require $\frac{421{,}200}{31{\cdot}25} = 13{,}478$, and 13,478 being divided by 76° gives 177·3 the number of feet which one pound must fall to heat a pound of air one degree, and from this unit of mechanical power for air, any one of the elements may be corrected, Joule's unit, for instance, if the specific caloric of air is accurately ascertained; or, if Joule's unit is correctly ascertained, then the specific caloric of air will be known, being divided by Joule's unit, 772 gives 17·42 the number of degrees one pound of water would be heated, and also the number of degrees one pound of air would be heated if air had the same specific caloric as water; but as the specific caloric of bodies is inversely as their power of being heated, divide 17·42 by 76° it will give 0·229 the specific caloric of air. Now, as my experiments with the double nephelescope give the specific caloric of air 0·218 and Regnault's 0·23, and as Joule's unit brings out an intermediate number, Joule's unit is probably correct, and certainly cannot be altered, till some of the elements from which I have confirmed it are altered by more careful experiments, or by more careful calculations from the same elements. I have never seen how Joule experimented in obtaining his unit, but it will be gratifying to that gentleman to learn that his result is confirmed in so simple a manner by my experiments, as it certainly is gratifying to me, to find that my law of cooling by the expansion of air is in perfect harmony with his most beautiful principle. I have not M. Regnault's determination of the specific caloric of air before me; but according to my recollection it is between 0·23 and 0·24, and my experiments with the double nephelescope make it 0·218. If we assume Joule's unit as accurate, using that as an element the specific caloric of air is exactly 0·229.

It follows also from Joule's principle that we may easily find the temperature of air condensed into double, treble, &c., densities, if we take Regnault's authority for granted, that the specific caloric of air is the same at all densities and temperatures.

For if we suppose a cylinder of air at half density with a temperature of zero condensed by pressure into half the space, it will be heated by the process 76°, and if it is condensed into one-fourth the space, it will require twice the force moving through one-and-a-half times the space, and will thus produce an increase of temperature of $3 \times 76°$; it will require four times the force moving through one and three-fourths the space if it is condensed into one-eighth the space, and that is $7 \times 76°$, the next duplication will increase the temperature to $15 \times 76°$, the next to $31 \times 76°$, and so that at the distance of 35 miles below the surface of the earth the air by its own pressure, supposing it doubled its density every three and a half miles, would be 1024 times as dense as at the surface of the earth, and 153,748° hot.

This calculation is made on the supposition that Regnault's experiments have proved that the specific caloric of air is the same for all temperatures and densities. According to my experiments with the double nephelescope, the specific caloric of air diminishes as the density increases; a double density giving 6½ per cent. less specific caloric, the heat, therefore, if my experiments are correct, is much greater than the estimate above. Certain it is, when double density was used, the cold of expansion into double space was 81°, whilst with common air the cold was only 76°.

The specific caloric of steam may also be calculated from the mechanical unit of heat. For as a column of air 780 feet long of one square foot area contains 62·5 lbs. in weight, the quantity of steam in pounds which is contained in an equal column can be calculated by taking $\frac{5}{8}$ of its weight, and diminishing that quantity in proportion to its temperature above zero. For example: at ½ density the column of air at zero of the above size weighs 31·25 lbs., $\frac{5}{8}$ of which is 19·54 lbs., and this diminished by $\frac{180}{428}$ of the whole is 13·95 lbs., which a column of steam at ½ atmospheric pressure and 180 in temperature weighs.

Now, if the area of the end of the cylinder, 144 inches, is multiplied by 7·5 lbs., which must fall 390 feet to produce double density in the steam, and thus raise its temperature 32°, it will make 10,880, and this multiplied by 390 makes 424,320, and this power heats 13·94 lbs. of steam 32°; consequently, $\frac{424320}{13·94}$ will be required to heat one pound 32°, but if this last number, $\frac{424320}{13·94}$, be divided by Joule's unit, 772, it will give the number of degrees a pound of water would be heated by the process 39·255°, and as the specific caloric of bodies is inversely as their powers of being heated, if 39·255° be divided by 32°, it will give 1·223 the specific caloric of steam at atmospheric pressure and 212° temperature.

In like manner I have calculated the specific caloric of steam for the several densities and temperatures below.

The first column contains the pressures in atmospheres; the second the temperatures; the third, the number of pounds of steam in the column to be heated by the condensation; the fourth, the mechanical power required to produce the condensation; the fifth and last, the specific caloric of steam at the different densities.

Atmospheres.	Temperatures.	Pounds of steam heated.	Mechanical power.	Specific caloric.
½ to 1	212°	13·95	421,200	1·223
1 to 2	248·5°	26·52	842,400	1·067
2 to 4	293·4°	50·23	1,684,800	0·965
4 to 8	343·6°	94·40	3,369,600	0·916
inches.				
0·2 to 0·4	52°	0·2427	11,232	1·50

From this table, unless there is some miscalculation, it appears that the specific caloric of steam diminishes as the density increases, as that of air does.

There is in fact a diminution of 25 per cent. from one atmosphere

to eight in density or rather in tension, for with eight times the tension the density is only about 6·7 times greater.

It appears also from the principle in question that in condensing air the higher the initial temperature the greater will be the heat produced by condensation—so that if air should be used at 448° or 461°, according to Regnault, above zero, a condensation into half the space would heat it $2 \times 76°$, and so in proportion.

For the Journal of the Franklin Institute.

Japan; its Industry and Meteorology.

About two years ago, when the United States Steamship *Mississippi* was about to sail for China, the Chairman of our Committee on Meteorology, requested Mr. Joseph H. Warrington of the Engineer Corps on board that vessel, to transmit to the Institute any information on scientific or industrial subjects which he might obtain during his visit to the Asiatics. By a letter from Mr. Warrington, dated Simoda, Japan, March 16th, 1859, the committee have been placed in possession of the appended meteorological table, made from observations taken at that place by Townsend Harris, Esq., U. S. Consul-General. They are probably the first published observations of an American in that country.

The Report is preceded by a notice of the Japanese and their productions, from which we extract the following:

So much has been said of the capabilities of the Chinese, that I really expected to find them a very smart people, but I have been greatly disappointed; and except their shrewdness and cunning, I must say that they have not one redeeming quality, and are a disgusting people. Not so with the Japanese, they are a very intelligent race, and are vastly superior to the Chinese in every respect; they are very cleanly in their habits; never enter a house with their shoes on; and excel in every thing which they undertake. They make shot and shell —and when at Hakodadi I endeavored to get a hollow shot for the Institute, but could not. Their casting is perfect; I had several very fine specimens, but they were sent away with several other things in a mistake, and it is very doubtful if I ever obtain them again; one was a casting in copper of a stag, which is equal to any thing of the kind I have ever seen in any of our large establishments like Cornelius, Baker & Co., or Archer, Warner & Co. If we go to Nagasaki I will try to get some more—their lacquer ware has a world-wide reputation. I have endeavored to obtain a specimen of the liquid lacquer, but failed. They make very neat joints in all their work, and have succeeded very well in constructing one or two vessels of about 300 tons. Their money is principally silver and copper. The kobaug, valued at about seven dollars, is gold; the itzabu is silver, and is rectangular in shape; the half itzabu has some gold in it, I believe, although the specimen which I have looks more like being washed with a solution of copper than an alloy of gold and silver. The copper coins are cash, 1475 of which are worth one dollar; the itzabu is valued at about 33

cents. The late treaty fixes their value by this standard;—"silver money will be taken weight for weight, with a deduction of six per cent. for expense of re-coinage."

The Dutch government have constructed a large machine shop at Nagasaki, where the Japanese receive instruction in the fabrication and management of steam engines. The shop is well fitted up with good tools, and some of the work I have seen, done by one of the apprentices, would do credit to a journeyman in the States.

They are very great adepts in the art of casting; and I saw a small 12 lb. howitzer in the lathe, which was beautifully cast. They have a small steamer which they bought from the Dutch government, and which runs up to Yeddo; the apprentices take turns in going aboard the steamer; but they cannot stand the heat. The profession of engineering is held in very high esteem by all the people, and they pay more respect to an engineer than they do to any of the other officers. If any of us (our corps,) are introduced to one Japanese officer by another, he tells him that we are "officer machinist," and we are sure of the greatest courtesy.

Meteorological Observations made at the United States Consulate-General, Simoda, Japan. By Townsend Harris, Esq., U. S. C. G.

Year.	Month.	Thermometer.				Winds.					Weather.			
		Highest.	Lowest.	Mean.	Extreme daily range.	N. & E.	N. & W.	S. & E.	S. & W.	Calm.	Rain.	Showers.	Cloudy.	Fine.
1856.	October,	77	51	64·3	15	17	4	5	5	4	3	5	5	18
"	November,	69	46	57·4	14	12	4		9	5	2	1	2	25
"	December,	69	36	48·9	17		16	1	13	1		4		27
1857.	January,	54	33	45·1	15	75	20			4	2	1	3	25
"	February,	63	32	45·5	19	9	13		5	1	4	4	4	16
"	March,	63	38	51·6	13	11	6	3	7	4	5	4	2	20
"	April,	67	43	57·2	14	6	5	3	13	3	4	2	3	21
"	May,	73	55	64·1	14	15	3	2	9	2	11	2	6	12
"	June,	80	59	70·8	10	6	1	4	16	3	7	6	3	14
"	July,	84	66	76·1	7	5	2	1	21	2	5	5	3	18
"	August,	87	67	77·7	10	12			14	5	4	4		23
"	September	85	62	75·4	12	11	3		11	5	4	3	2	21
For 12 months.		87	32	61 17		107	77	19	123	39	51	41	33	240

Remarks.—The thermometer was noted at 8 A. M.; noon, 4 and 10 P. M.

Winds from the cardinal points are put back one point, *i. e.*, north is put down northerly and westerly, and south southerly and easterly, &c.

The *prevailing* wind of the day only is noted.

Warmest day, August 7th, mean 83·25°.

Coldest day, February 2d, mean 36·25°.

February 11th, 4 A. M., thermometer stood at 28°.

First white frost, December 12th.

Ice made on eight nights.

Snow fell twice.

Earthquakes, thirty-four, all light.

Only one severe gale of wind.

Thickest ice 1¼ inches.

Ice or snow melts before 2 P. M.

Warmest month, August, mean 77·7°.

Coldest month, January, mean 45·1°.

*On the Practical Bearing of the Theory of Electricity in Submarine Telegraphy, the Electrical Difficulties in Long Circuits, and the Conditions requisite in a Cable to insure rapid and certain communication.** By S. ALFRED VARLEY, Assoc. Inst. C. E.

(Continued from page 206.)

Mr. CROMWELL VARLEY said he could answer some of the questions put by Professor Tyndall. He had consistently recommended to the Electric and International Telegraph Company the use of wires of large diameter, for the last twelve years, as the only means of obviating the difficulties experienced on long circuits in wet weather from leakage, which, with the earlier forms of insulator used, was very great. Since the introduction of submerged wires he had pointed out the advantage that would be gained in such circuits of great length by the use of copper wire of large sectional area. On his recommendation the directors of the above-named company had tried both of these experiments on a large scale. They had erected iron wires of No. 3 wire-gauge on the London and North Western Railway, on the Great Western, and the London and North Western Railways, instead of the usual size (No. 8.) The results were such that he had no doubt they would never again, for long circuits (viz: of over 200 miles in length), erect other than thick wires. They had tried thick wire under the sea in their new cable connecting England with Holland. This cable contained four conductors of No. 13 instead of No. 16 wire, and although, for reasons explained further on, the relative speed of this compared with that of the former size was not so great, yet there was a very decided gain in rapidity, together with much stronger and much more uniform and reliable currents. These wires were connected both in England and Holland with a considerable length of overground wire, which latter was much affected by changes of the weather, and the gain in unfavorable weather from using the larger wire was, as predicted, very considerable. He was very much surprised to find Mr. C. V. Walker adhering to, and supporting, views which other well-known electricians had put forward, viz: that increasing the sectional area of the wire did not increase the rapidity of the transmission of electric signals. The experiment, however, had been lately tried in the new Dutch cable, and although the relative speed was not exactly known because there were many difficulties in the way, yet the fact was established that increasing the sectional area had greatly increased the speed. He had tried to determine the effects of induction, &c., on the speed of the electric wave; not only had the inductive effect to be taken into consideration, but also the absorption of electricity by the surfaces of the dielectric, and these influences were ever changing by heat and by the charging of the wire to such an extent that approximate results only were obtainable, which, however, were sufficiently near for all practical purposes. The absorption of electricity by the surface of the dielectric required time, and therefore cables of such length and dimensions as would only work slowly, suffered more from this absorption than shorter and

* From the Jour. of the Society of Arts, No. 332.

quicker ones. The retardation of the wave in a cable was caused by the lateral induction absorbing part of the electricity intended to give the signal through the line, and until this charge approached the maximum the current at the distant end would be weak. If two cables were made, the one with an iron and the other with a copper conducting wire inside the gutta percha, all other things remaining the same, the former would have as much induction as the latter, because this had reference only to the surfaces of the dielectric. As the iron wire would only conduct at one-quarter the speed of the copper, it would require, with a given electro-motive force, four times as long to transmit a given current. The electricity would require, in the case of the iron wire cable, four times as long to charge the gutta percha, by lateral induction, as the copper wire would, consequently such a cable would have only one-quarter the speed of the other. Were it possible to compress twice as much copper into the same diameter, and so double the conducting power without increasing the inductive surfaces, the speed would be immediately doubled. This was not possible, and the effect could only be obtained by increasing the sectional area of the wire; increasing this four times, doubled the interior surface of the gutta percha, which was the chief inductive surface, and, leaving out of consideration for a moment the exterior surface, the conducting power would be quadrupled while the induction was only doubled; hence there would be a gain in speed of from 1 to 2. But there was more still than this gained; first, suppose the diameter of the small wire to be unity, and the thickness of the gutta percha covering also unity, the exterior surface of the gutta percha would be 3, and the combined surfaces of the gutta percha would be $3+1=4$. In the second case, where the copper wire was doubled in diameter, and quadrupled in weight, there would be two for the inner surface of the gutta percha, and four only for the outer surface, instead of six—collectively, six instead of eight. Hence doubling the diameter more than doubled the speed. The third gain from the large wire was, that, having a higher speed, there was less time for the absorption of electricity, and, consequently, the disturbance and retardation from this cause were less. Having a current of four times the power entering the cable, and the leakage being less in proportion to it, the current received at the distant end would be more than four times as powerful, and much more regular; the apparatus would be less frequently interrupted for adjustment, and would, consequently, work without intermission for a much longer period than the smaller wire. Mr. Walker had alluded to the Atlantic cable, and stated, in proof of the sufficiency of the diameter of the copper wire, the fact that a single element of water battery gave a current perceptible at the other end. He (Mr. Varley) contended that this proved nothing as to its ability to transmit intelligible signals. In an Atlantic cable we must have not only a wire capable of giving currents and signals, but of giving such currents and signals as should overcome the friction and inertia of the apparatus used for indicating them; these currents must be so powerful and constant, that, when the philosopher had left the cable to the ordinary manipu-

lator, the currents should not fluctuate so much as to interrupt the intelligibility of the communications. The current must have such force, that the varying friction of the apparatus should not materially influence the recording of signals. In the Atlantic experiment these difficulties were overcome to a great extent by a most ingenious little instrument—Professor Thompson's reflecting galvanometer. In this instrument the only friction was that of a single thread from a silk cocoon, supporting a very short magnetic needle, only $\frac{1}{3}$ of an inch in length, which carried a small mirror made so light as to weigh only a grain or two. The mirror reflected back through a lens a ray of light, and thus without impeding its free action, or adding to its friction, a long but imponderable arm was added to the needle to magnify its motion. This little needle was rendered more or less nearly astatic by placing a large magnet under it to neutralize the earth's magnetism, and thus a nearly astatic instrument, sufficiently rapid in action from its small dimensions, sufficiently sensitive by its long imponderable arm (or ray of light), sufficiently free from friction by being suspended from a filament of silk, was obtained, and by it the faint signals through the cable were rendered visible. These signals were watched by a clerk, and recorded by hand on a Bain's printing machine. He (Mr. Cromwell Varley) felt that sufficient credit had not been given to Professor Thompson for this instrument, without which the Atlantic cable would never have transmitted a single message, and the world would not have had this great experiment to guide them, as there would have been no means of ascertaining whether the cable had reached the bottom of the Atlantic without parting. Such an instrument, however, was not calculated to meet the requirements of a commercial undertaking, because the reflected spot of light was difficult to follow with the eye for any length of time, and was often recorded by the manipulator incorrectly. The current must have sufficient force to record itself. With regard to the insulating properties of gutta percha, when pure and free from moisture he had found it to rank among the best dielectrics, but this was not the condition of the gutta percha used on cables, which appeared to be porous and to contain moisture. When the gutta percha was sufficiently heated to free it from this, there was great danger of altering its character, and rendering it liable to become brittle and to crack. In the Atlantic cable, even before it had been put under water, the loss of current by leakage was so considerable that less than one-third of the original current only reached the distant end. Were the loss constant in quantity it would not so much matter, but wherever the current escaped through moisture, there was polarization and ever-varying resistance at the leaky spot. As an example, he would quote one of many similar cases that had come under his notice. In one of the London and Liverpool wires, there was a defect in the Kilsby tunnel, caused by a filament of wood in the gutta percha, which was wet at this spot. This leak gradually got worse and worse, and sometimes offered a resistance equal to ten miles of the line composing the circuit, and at other times, especially after the continuous passage of a positive current for some length of time, it offered a resistance

equal to more than a thousand miles of the circuit. The fault was situated nearly half way, roughly speaking, 100 miles from the end, and when it offered a resistance of only 10 miles, $\frac{1}{1}\frac{1}{1}$ only of the current from London reached Liverpool, assuming the rest of the line perfectly insulated. When the fault from polarization, &c., offered 1000 miles resistance, the current which reached Liverpool was $\frac{1}{1}\frac{0}{1}$ of that which left London; these fluctuations sometimes took place in a second of time. The formulæ for such a case was $e = \frac{E\,l}{l+y}$, where e was the current received at the distant end, E the current leaving the original station (London), l the resistance of the leak, and y the resistance of the line between the leak and the receiving station. Now in the former case, the current was amply powerful enough to work the instruments, and no inconvenience would have been experienced had the fault remained constant, but, on the contrary, it was always varying in force, and to such an extent that it was impossible to work the line though only 200 miles in length. Thus it would be seen that, leaving out of the question induction, and its consequent diminution of speed, a conductor of sufficient size must be had to cause these leaks to bear only a small proportion to the current transmitted, in order that the received signals might be sufficiently regular and equal in force to record themselves with certainty and ease. Unless these conditions were attended to, the cable, as a commercial undertaking, would inevitably fail. With regard to the rapidity of conduction of the electric current, his opinion was that the current began to flow from the distant end *immediately* after the near end was connected to the battery. Electricity showed no signs of compressibility or elasticity, and was without inertia. Suppose, for a moment, that a cable was divided into several portions, each of which was without appreciable resistance, but separated from the next portion by a given resistance, the first portion, on coming in contact with the battery, would be instantly charged, and as instantly would begin charging the next portion, but to a lower degree than itself; this second portion as instantly charged the third portion, to, of course, a still lower degree; and this the next, and so on to the end. By careful reasoning on the known laws of electricity he had come to the conclusion that the current began to flow out of the distant end instantly, but so feebly at first that the most delicate instruments failed to show it. Before concluding, he would draw attention to the unhappily chosen terms "quantity" and "intensity." What in England was generally understood by "quantity," was in Germany termed intensity or I. What in England was termed "intensity" or tension, was the electro-motive force; in other words, the $I = \frac{E}{R}$, where I represented the power of the current to decompose a given quantity of an electrolyte, E the electro-motive force of the current, and R the resistance of the circuit. These terms had unfortunately led many into error, more especially the word "intensity."

Mr. C. W. SIEMENS agreed with much that had been said in the paper. He was decidedly in favor of a large conductor of the very best specific conducting power; and had maintained from the first that the conductor of the Atlantic cable was totally inadequate. When he read a paper last year before this Society, he had expressed the laws by which the proportion of an electric cable should be regulated for a given length by a simple formula; and he thought that a mathematical expression properly explained was preferable to an explanation in words only, even for a popular assembly like the present, because it combined all the elements to be taken into consideration. He did not agree with Mr. Varley that an electric wave on entering a submerged cable at one end presented itself, in however slight a degree, instantaneously at the other. The laws of induction and conduction, as he understood them, were directly opposed to such an assumption; and in his own experience he had certainly never observed any indication of it. The line expressing the relative amount of charge at different points of the electric wave in the conductor, was expressed not by a dynamical curve, as Mr. Varley had shown it, but by a straight line, terminating abruptly upon the horizontal line which represented the conductor. Another portion of the paper dealt with the complete metallic circuit in submarine conductors, which it was generally understood had been first proposed by his (Mr. Siemens') brother. Mr. Siemens could not agree with the views expressed by Mr. Varley, and by several others who had lately written in the scientific journals upon this subject. Some of them seemed to lose sight entirely of the most essential condition, namely, that the two conductors were to be embedded in the same insulating medium. His brother had never for a moment assumed, as seemed to be supposed, that lateral induction between the two conductors constituting the circuit would be obviated. On the contrary, it would be rather increased on account of the greater resistance of the metallic circuit. But it was maintained that the charge between the conductors and the larger surface of the sheathing would be nearly entirely obviated; that the working of one metallic circuit in a multiple cable (which his brother had chiefly in view) would not disturb the electrical equilibrium of the other conductors; that the losses by leakage would be reduced, enabling him to reduce also the area of the conductor, and thereby also the lateral induction between them; that the metallic circuit was not affected by magnetic storms; and, finally, that considerable advantage could be obtained by the mutual acceleration of the positive and negative currents by Volta induction. So long as a single conductor could satisfy the public demand for messages, the advantages of a metallic return wire would probably not warrant the additional expense, but wherever several conductors became necessary, the advantage of working through metallic circuits would be very great. Mr. Varley's illustration of surrounding the one conductor by the other (in the form of a tube) did not meet the case, because the tubular conductor possessed the very condition which it was intended to avoid, namely, an extended inductive surface both against the inner conductor and the outer sheath-

ing. Mr. Siemens had only one other point to remark upon, and that was of an historical nature. Mr. Varley had stated that Mr. W. Siemens had first employed gutta percha coated wires in Prussia in 1850, where he had observed the phenomena of induction also. It was, however, in 1847 when the first gutta percha coated line wire was laid down successfully near Berlin; and he (Mr. Siemens) exhibited specimens of it, and explained the phenomena of charge which had been observed, before this Society in 1848. He might also observe that the statements which had been circulated, that the gutta percha coated wire, as first prepared in Prussia, had proved an entire failure, were very unfair towards his brother. These wires had been coated in the same manner as they were at the present day, although it must be admitted that the quality of the gutta percha employed was very inferior. These lines had, however, done good service for four or five years, when they began to fail; some of them had, however, lasted much longer, and some—covered with lead—were actually in use to the present day. He did not think that a much more favorable result had since been obtained elsewhere.

Mr. LEONARD WRAY said he would make but a few brief remarks upon some of the points under discussion. In the first place he considered that the paper read by Mr. Varley was a very valuable and instructive one, for which all present must feel indebted to him. Let the ideas brought before the Society that evening be designated as mere conjectures, or theories, or what not, still he ventured to differ from Professor Tyndall's opinion, that Mr. Varley should have confined them to his own breast until he had fully tested and proved them practically, inasmuch as Mr. Varley, by giving publicity to them before that Society had, in fact, laid them before the whole world of science, and the result would be, that instead of these ideas remaining stored up in his own mind alone, to be worked out solely by his own individual energies, there would now be many, very many, minds brought to bear upon them, and to assist in reducing them the more speedily to the test of practical experiment. The next point he would remark upon was the best diameter for the conductors of electric telegraph cables, a subject which was so very much discussed, and so very much disputed, that he would only present to the notice of the Society one very singular and significant fact bearing upon the question. When telegraph wires were first introduced into India, Sir W. O'Shaughnessy and his staff were sadly annoyed by the continual breakings of their wires, caused by very large birds alighting upon them. To remedy this nuisance that gentleman employed very thick, strong wires which these birds could not injure; and this great increase in the size of the wires brought out the remarkable fact that no insulation whatever was necessary at the posts around which they were simply wound. This deserved, he thought, to be recorded in such a discussion as the present. The third and last subject to which he (Mr. Wray) would refer, was that of insulation. Now, the substance almost universally used as an insulating material was gutta percha; but they were told, and many of them knew it as a fact, that gutta percha

absorbed no inconsiderable quantity of electricity; indeed, that it became, to a certain extent, saturated with it. Such being the case, it must be evident that gutta percha was by no means a perfect insulator, for he held it as an axiom, that no really good and perfect insulator would absorb electricity. The greater the quantity of electricity absorbed by the insulating material used, the greater would be the retardation of the current. Hitherto, then, a substance had been employed which was very far from perfect, and all calculations had been based upon its known insulating properties; but if they had a superior —a very much more perfect insulating material—would it not be possible to construct cables with a far less quantity of that material than gutta percha? He thought so, and he moreover believed that such an insulating material as he had spoken of, would, very probably, be soon discovered.

Mr. S. Alfred Varley said he had but little to reply to, as no attempt had been made to refute the views he had brought forward. He was unable to follow Mr. C. V. Walker throughout, and he did not clearly see the direction in which his views tended. Mr. Walker appeared to object to the statement made, that there was a difference between an ordinary Leyden jar and a submarine circuit; yet he admitted that the conductor united the inner and outer coatings of a submarine wire when regarded as a Leyden arrangement, and that the resistance it opposed was the only thing which prevented the free flow from the one to the other; now he (Mr. Varley) thought this was a most important admission, for upon it depended the reason why a large wire conducted more rapidly than a smaller one, and this was no longer a theory, but an ascertained fact. If there were no difference between a submarine wire and an ordinary Leyden jar, and if a submarine circuit had to be charged statically to saturation before signals passed, as was stated to be the case by the advocates of the small wire system, then it would be clear that as the greater the sectional area, the larger the Leyden arrangement would be, there would be more retardations with larger conductors, as more electricity would be required to charge them. He maintained that, in practice, a submarine circuit was not charged to saturation; the degree to which it was charged statically depended upon the relative balance between the conditions which favored induction and conduction; if the conditions, as had been stated in the paper, favored conduction, there would be less statical charge, and a greater proportion of the electrical impulse would be directed forward, and signals would be obtained more quickly. He fully concurred in all the views expressed by Professor Tyndall, and quite agreed with him as to the desirableness of searching for facts with actual submarine circuits of varying dimensions; but when these were not at command, he thought we should not wait for such favorable conditions for experimenting, but should endeavor to obtain the best substitute we could. Moreover, if it were possible to obtain all the conditions which submarine circuits presented in our own private laboratories, this would be a positive advantage, for the whole being under immediate command, and not disturbed in any way by

atmospheric causes, more or less defective insulation, or other disturbing influences always occurring more or less in practice, we should be enabled to trace out principles more clearly and have fewer sources of error to eliminate. Mr. Siemens, when considering the question of the complete metallic circuit *versus* the earth for one-half of it, objected to the fairness of the diagram in which one of the conductors was made into a tube. This diagram was introduced, as was stated in the paper, as an exaggeration, simply to show the fallacy of the principle; and although, as was stated by Mr. Siemens, the wires would not, when side by side, present as much surface to induction as an ordinary circuit, yet it must be borne in mind that there would be just twice the resistance of that which would be opposed when the earth was employed for one-half of the circuit, and this would more than counterbalance the lessened surface exposed to induction. He agreed generally with the remarks made by Mr. Wray. There was no doubt that with large conductors imperfect insulation was less felt, but the result in Sir W. O'Shaughnessy's case was probably not altogether due to the size of the conductor, for it must be remembered that the climate was very hot and dry. As a practical fact, he (Mr. Varley) would state that when in the Crimea they never obtained what telegraphists termed a "perfect earth." In the submarine circuit between Varna and Constantinople, contact with the earth was made by connecting a wire to the iron sheathing of a piece of the cable, more than a quarter of a mile in length, which was buried in the earth, and passed through the British Embassy grounds, yet, notwithstanding this extensive surface, in hot weather he found the earth, to use a telegraphic expression, very far from "perfect," and he remedied this by carrying a wire out into the Bosphorus.

The CHAIRMAN said, before proposing the usual vote of thanks, he would express his opinion of the result of the discussion that evening. They had advanced very little in practical knowledge since the failure of last year with the Atlantic cable; but the proper way of doing so was to follow the course pointed out by Professor Tyndall. At the same time he thought it was well that theories should be advanced with a view to set men thinking; but the professor no doubt meant to pay Mr. Varley the compliment that his knowledge of this matter would be better applied to the practice than the theory of the subject. But Mr. Varley was, in fact, doing what had been asked of him; and it was only owing to some delay in the completion of an elaborate instrument that he was not able to lay before them the results of actual experiment. The *experimentum crucis* was what they really wanted; wires of different conducting powers tested against each other, and the results ascertained by the best class of instruments, and, he would add, by a variety of experimenters. He found that electricians still remained true to their colors, in the absence of positive results one way or the other. His friend Mr. Walker still adhered to the small wire, whilst others appeared as the consistent advocates of a large wire as the best conducting medium. In this country, such opportunities were presented for experiment upon a large scale, that they

had nothing to fear from theory; and he hoped such experiments would be made as would solve many of the points upon which so much diversity of opinion now prevailed. He would now propose a vote of thanks to Mr. Varley for his able and interesting paper.

For the Journal of the Franklin Institute.

Particulars and Performance of the U. S. Steamer Wyoming.

The above named steam sloop, the first finished of seven ordered to be built by Congress in 1857–'58, returned on the 6th of Sept., 1859, from a trial trip of two weeks duration, of which one week was passed at Charleston, to which port she went by order of the Honorable Secretary of the Navy.

The *Wyoming's* hull was constructed at the Philadelphia Navy Yard, under the supervision of Francis Grice, Esq., by whom she was designed.

It has the following dimensions, viz:—

HULL.—

Length, billet to taffrail,	232 feet	9 inches.
" on gun deck,	209 "	9 "
" between perpendiculars,	198 "	6 "
" of keel from back part of forward stern post,	188 "	
Width of beam molded,	32 "	2 "
" " extreme,	33 "	
Depth of hold,	15 "	10 "
" forward and aft of machinery space of lower hold under berth deck,	8 "	10 "
Space allotted to machinery, comprised between two wooden water tight bulkheads,	50 "	8 "
Draft of water loaded, forward,	12 "	7 "
" " aft,	13 "	2 "
Displacement,	1475 tons.	
Area of immersed midship section,	391 sq. feet.	
Tonnage (custom-house measurement),	997 tons.	

Carries three months provisions, six months stores.

SPARS AND SAILS.—Barque rig.—

Foremast above deck,	54 feet.
Main mast "	59 "
Mizen " "	53 "
Fore and main topmast,	36 "
Mizen "	35 "
Bowsprit outboard,	26 "
Jibboom,	25 "
Spanker boom,	50 "
Area of sails,	9705 sq. feet.

ARMAMENT.—

2 11-inch pivot guns and carriages.	
4 32-inch guns " "	
Weight of guns in all,	40 tons.
" ammunition for guns,	30 "

The machinery was designed and constructed by Messrs. Merrick

& Sons, of Philadelphia. The requirements of the Navy Department for the vessels of this class were stringent, and calculated to draw out the best talent of the country in their execution. The result of the trial of this ship shows that Mr. Toucey's efforts to increase the efficiency and economy of the United States Navy, have been effectual.

The guarantees required of the contractors for this and the other vessels of the same class, were briefly as follows:—

1st, That the weight of all the machinery, spares, tools, water in the boilers, and coal for five days maximum steaming, should not exceed 406 tons (of 2240 pounds).

2d, That the engines should be capable of making 80 turns per minute.

3d, That the machinery should be capable of developing 1000 horse power by indicator.

4th, That the consumption of coal per indicated horse power per hour, should not exceed a certain rate (in the case of the *Wyoming* 2·9 pounds).

All the ships were to be provided with a surface condenser.

The principal dimensions of the machinery for this ship are given below.

ENGINES.—Two horizontal double piston rod, direct-acting engines.—

Cylinders, diameter,		4 feet	2 inches.
" stroke of piston,		2 "	6 "
Crank shaft, diameter,			11½ "
Shafting, "			10 "
Fresh water air-pumps (two) diameter, each,			11 "
" " stroke,		2 "	6 "
Salt water circulating pumps (two) diameter,			10 "
" " " stroke,		2 "	6 "
Condenser—surface,	3000 sq. ft.		
Number of tubes (brass),	3000.		
Diameter "			0⅝ "
Length "		6 "	

Having its tubes secured at both ends in tube sheets, one of which is fast, the other free to move with the expansion of the tubes.

The engines have slide valves, and independent cut-off valves sliding within and upon them, which may be adjusted at pleasure, while in motion, to cut off between 6 and 21 inches from commencement of stroke. They are driven by links from the cross-heads.

The crank shaft bearings are four in number: the after one 24 ins. long, the two middle ones 18 inches each, and the forward one 16 ins. They are in four pieces each, chambered to allow of the passage of water around without touching the wearing surfaces. Each piece, or all, may be removed without moving the crank shaft. The upper and lower pieces are not keyed up, but simply slipped, when raised or lowered to overcome the wear. The cap-bolts being horizontal, take the direct strain. The eccentrics and link motions are between the engines.

The propeller shaft is covered with brass where it passes through the deadwood, and revolves in lignum-vitæ bearing bushes, 7 feet 6 inches in total length.

The thrust is taken either on spherical steel rollers, or on the usual collar thrust, as may be preferred.

The engines drive the line of shafting by a clutch coupling having four steel faces. This may be disengaged in a moment when the ship is put under sail alone.

Space occupied by engines in length of ship, including passage ways 19 inches wide, both forward and aft,	15 feet 11 inches.

BOILERS.—Three of Martin's vertical tubular, having iron shells and brass tubes, placed two on one side of the ship (of which one consists of a single furnace, and is used as an auxiliary or "donkey"), and one on the other side, facing each other, with a fore and aft fire-room between them.

Length occupied in the ship,	24 feet 9 inches.
Breadth, " " including fire-room,	29 "
Depth, exclusive of steam drum,	10 " 2 "
" inclusive " 10 feet diameter,	14 " 2 "
Fire-room, length,	24 " 9 "
" breadth,	8 " 6 "
Surface in all boilers,	7890 sq. ft.
Tubes, number "	4280.
" length,	2 " 7¼ "
" external diameter,	2 "
Grates, number,	14.
" breadth (except of donkey, which is 2 feet 6 ins.),	3 "
" length,	5 " 10 "
" area,	242 sq. ft.
Smoke-pipe—one telescopic in two sections.	
" height, when up, above deck,	40 "
" " " grate,	53 "
" diameter,	6 " 10 "
" area,	36·7 sq. ft.
Least area between tubes in all boilers,	39·65 "

PROPELLER.—One brass true screw.—

Number of blades,	4.
Diameter of screw,	12 feet 3 inches.
Pitch "	19 "
Length "	2 " 6 "
Weight of all machinery, spares, &c., and water in the boilers,	227·6 tons.

COAL BUNKERS—Extending over the boilers, partly over the engines, and between the boilers and engines, leaving only a passage way, in which are placed the hand pump and donkey pump.

CONTENTS—163 tons anthracite—also, forward of the machinery space is an extra bunk carrying 72 tons—making 235 tons in all.

Performance.

The following is an abstract of each half day's performance during the trip out to Charleston and back. On the outward passage the engines were run at easy speed. That passage, from the Capes of the Delaware to Charleston bar, was made against a head wind and moderate head sea, in 59 hours 40 minutes running time; average speed by Massey's patent log, 9·3 knots per hour the whole distance. On the homeward passage the wind was favorable, but light, for 24 hours; the rest of the time ahead, increasing to a moderate gale for the last 10 hours before reaching the Capes. Time, 46 hours 45 minutes from the Bar to Capes of the Delaware; average speed 10·8 knots. Highest speed under steam alone for one hour, 11·5 knots. Highest for six consecutive hours, 11 knots.

Outward Trip.

Hours.		Revols. per minute.	Steam pounds.	Vacuum inches.	Cut-off inches.	Throttle, per cent. open.	Indicated horse power.	Temp. feed water.	Saturat'n in boilers, 1·32 unity.	Coal per hour.	Coal per i. p. per hour.	
Aug. 25,	11	45·3	15·81	22·45	13·3	·25	302·3	83°	0·00	1089	3·60	Mod. head sea.
" 26,	12	54·0	14·58	23·30	14·3	·29	370·4	84°	0·00	1280	3·45	" " wind & sea.
	12	63·4	16·10	23·50	9·0	·74	503·1	90°	0·25	1415	2·81	" head swell lig't N.E.
" 27,	12	63·0	17·00	23·70	8·5	·62	466·8	87°	0·62	1514	3·21	" " sea fresh N.E.
	12	64·1	16·85	23·46	8·5	·79	504·8	89°	0·93	1560	3·09	" " "
" 28,	1	66·6	17·00	23·00	8·5	·80	568·7	88°	1·12	1500	2·60	" " "
Mean.		58·2	16·20	23·29	10·62	·60	433·9	86°	0·37	1378	3·17	

Homeward Trip.

Sept. 3,	10	69·0	17·50	22·33	10·45	·85	619·0	86°	0·80	1740	2·81	Fresh B. star'd. beam.
" 4,	12	71·7	17·42	22·90	11·25	1·00	709·3	89°	1·00	1680	2·37	Sail set, very light B.
	12	73·3	17·33	22·00	10·04	·77	621·7	86°	1·06	1780	3·02	" "
" 5,	12	69·8	17·25	20·50	10·60	·75	581·5	88°	1·12	1820	3·09	Light B ahead, increas'g to head wind & sea.
	12	72·5	14·83	20·50	11·50	1·00	618·7	83°	1·20	1710	2·77	Delaware Bay and
" 6,	2	74·5	18·25	23·50	11·50	1·00	793·0	90°	1·18	1760	2·22	River.
Means.		71·45	16·90	21·68	10·78	·85	637·8	86°	1·05	1746	2·73	

Pounds of coal used in outward trip, including passage down the Delaware river, of which, log is not given here, being broken by stoppages, was, . . . 111,140

Pounds of ashes thrown overboard in all was, . . 21,741

Per centage of ashes to coal, . . 19½ per cent.

Pounds of coal used in homeward trip, . . 121,240

" ashes " " . . 21,765

Per centage of ashes to coal, . . 18 per cent.

The coal and ashes were both carefully weighed.

In the table the mean horse power exerted was found in the following manner. A large number of diagrams were taken during the trip under different conditions of throttle, cut-off, pressure and vacuum. Each diagram was calculated and the mean pressure found. The *theoretical* mean pressure due to the boiler pressure, back pressure in condenser, and point of cut-off was then calculated, and the ratio found between the two mean pressures. By classifying these ratios for different conditions of throttle, considerable uniformity was observed to exist in the results; the actual mean pressures were as follows:

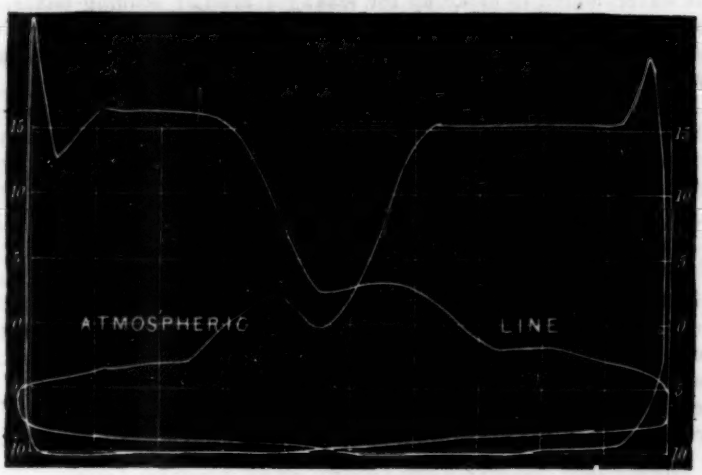
With throttle ¼ open 0·52 of the theoretical M. P.
" ½ " 0·64 " "
" ¾ " 0·72 " "
" ⅞ " 0·75 " "
" ⅞ " 0·78 " "
" wide 0·80 " "

For each hour, the boiler and condenser pressures, cut-off, and throttle being noted, the actual mean pressure and horse power were found by application of the proper ratio, and of those indicated horse powers the mean was inserted in the proper column. It is certain that the results must be substantially correct, and if any corroboration were

needed it may be found in the diagram given below, which was taken under conditions about the same as the average of the homeward trip, and the H. P. was for this diagram 315·36, and for that of the after engine at the same time 325·44, giving for both 640·8 H. P., or within 3 H. P. of the mean exerted by the table.

INDICATOR DIAGRAM, forward engine, taken Sept. 3d, 6·5 A. M.

Cut-off—10·5 inches.	Vacuum gauge—21½ inches.
Revolutions per minute—72.	Temperature hot-well—86° F.
Pressure of steam in boilers—18 lbs.	Mean pressure—14·75 lbs.
Throttle valve wide open.	Coal per H. P.—2·80 lbs.



During the whole trip only 13 (out of 14) furnaces were in use. The greatest number of revolutions made was $79\frac{6}{10}$ per minute for one hour. The highest for any four consecutive hours was $74\frac{4}{10}$.

The average consumption of coal for 638 H. P. was $18\frac{3}{4}$ tons per 24 hours. At the same rate to make 1000 H. P. would require $29\frac{1}{3}$ tons. The engine bunkers therefore hold $5\frac{1}{2}$ days coal at maximum steaming, and the extra bunk $2\frac{1}{2}$ days more; giving the ship an average speed at sea of 12·528 knots, if the speeds are as the cube roots of the powers. In other words, at this maximum speed, 1 ton of coal drives the ship $\frac{12{\cdot}528 \times 24}{29{\cdot}33} = 10{\cdot}25$ knots distance, and the bunkers afford a supply of coal to perform 2410 geographical miles. At the speed averaged, and which can be readily maintained, of 10·8 knots per hour, one ton of coal drives the ship $\frac{10{\cdot}8 \times 24}{18{\cdot}75} = 13{\cdot}8$ knots distance, and the bunkers hold coal for 3240 geographical miles.

The coal burnt during the trial was Blackheath, an anthracite of qualities not favorable for pushing, being by no means a free burning

coal, and requiring a strong draft for its combustion. And although free from clinker, the ashes formed a very large per centage, 19 per cent.

It was on this account only that the machinery developed on the trial trip less power than its capacity, the coal consumed being 1746 pounds per hour on 228 feet grate, or 7⅔ pounds per sq. foot per hour.

The machinery worked with great smoothness and regularity, no trouble whatever having been experienced from hot journals during the trip.

The boilers were not blown at all to reduce saturation. The slight increase of saturation towards the end of the trip was caused by the salt water added to make up for leakages around stuffing-boxes, &c. To the latter cause is due the reduced vacuum during a part of the homeward trip, and until an opportunity was afforded in the Delaware river to put in fresh packing.

It should have been stated that the steam is condensed within the tubes of the condenser, and that the salt water is forced to circulate between and around them in a direction contrary to that taken by the steam.

To the Editor of the Journal of the Franklin Institute.

SIR:—In the *American Railway Times* of September 10th, appears an article entitled "Experiments on the Strength of several kinds of Building Stones," stated to have been "read before the American Institute of Architects, by Robert G. Hatfield, Esq.," but the Editor omitted to add "copied verbatim from the *Journal of the Franklin Institute* for March, 1858."—(See *Journal*, vol. 35, p. 158.)

For the Journal of the Franklin Institute.

Atmospheric Electricity. By JAMES P. ESPY.

It has not yet been ascertained by electricians, so far as I know, what is the cause of atmospheric electricity; those, however, who have studied my theory of storms and agree with me that there is an upmoving current of air in the centre of all storms, kept up by constant evolution of latent caloric, as the vapor condenses by the cold of diminished pressure as the air ascends with its vapor in it, will agree with me that it follows as a corollary from the following experiments, that *electricity must be generated simply by the upmoving current of air from the surface of the earth*, especially if it be violent enough, as it frequently is, to carry up drops of rain with it to a great height.

It is well known that all bodies, as Dr. Alex. Palagi of Bologne says, in their natural state give signs of positive electricity, when separating from the soil, and of negative, when approaching it. In the 23rd volume of Geneva Archives of Science, pp. 286 and 382, it is stated that Volpicelli caused a ball of metal to revolve on a horizontal axis of

glass, at a distance from that axis one metre and a half, and connected by means of a copper ribbon with a Volta's condenser—during a demi-revolution ascending, detaching it when descending—and in four demi-revolutions, he collected positive electricity enough to make the straws diverge so as to touch the interior sides of the electrometer.

When the connexion was made with the ball descending, negative electricity was obtained.

Now, in all storms, especially where floods of rain descend, there are at the sides and under those parts of the cloud where floods of rain descend, down-moving currents of air, and this will account for the sudden change of electricity from positive to negative so well known to all observers. Moreover, as there are thousands of up-moving currents of air every day nearly all over the earth, this theory will account for the upper air being almost always positively electrified, for a body cannot be removed upwards from the surface of the earth without becoming positively electrified, and, vice versa, a body cannot descend towards the surface without becoming negatively electrified. It would be well to examine the electric state of the air in the belts of high barometer, where the air must in general be descending, and also in the *annulus* of storms, where the barometer stands above the mean, and of course the air must be descending there, to see if the electricity is not sometimes negative, and, if so, electricity may become a means of predicting storms.

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*On Embroidery by Machinery.** By George Wallis.

(Continued from page 189.)

The original machine, as devised by M. Heilmann, was worked by one person, but had this feature been retained the economic value of the invention would have been lessened. It was only by extending the size and capabilities, improving the structure of the parts, without in any way interfering with the principle, which has always been the same, that it could be brought into successful operation as a paying manufacturing agent. In Switzerland the original form is still retained for cotton embroidery, and found to answer for that class of work.

From the time of its first introduction into England, until within the last two or three years, the embroidering machine was employed only by Messrs. James Houldsworth & Co., of Manchester, as the successors of Mr. Louis Schwabe. A few machines are now used by one or two other persons at Manchester, but the great mass of productions in machine embroidery still emanate from the original proprietors, who have some twenty machines, more or less actively employed.

After the death of Mr. Louis Schwabe, in 1845, these machines were gradually brought to bear upon ladies' dresses, and during 1847 and 1848, at which period I was actively engaged with my friends,

* From the Jour. of the Society of Arts, No. 333.

the Messrs. Houldsworth, in the development of the capabilities of the machines in this direction, it is not too much to say that the productions of this house, by mechanical means only, did much to foster and keep up the demand for embroidery; and so far from interfering with the hand labor, it is a fact that, in 1849, there were in London alone some 2000 persons obtaining their living by embroidery who had never done so before, and in Scotland and the north of Ireland some thousands of females were employed in this industry, not in large factories, but in their own houses. The patterns were printed in outline upon the merino or other fabric to be embroidered. These were distributed by traveling agents, and were afterwards collected by them from the workers after the embroidery was finished. As is now generally known, this is the method pursued in Scotland and the north of Ireland in the production of sewed muslins and tambour work.

The advantages of the embroidery machine over hand labor lie chiefly in two points.

1. The rapidity, accuracy, and excellence of work in the production of repetitions of the design in borders, sprigs, flounces, and trimmings for dresses.

2. The perfect embroidery of a pattern on each side of the fabric, as in the case of window curtains, table covers, and trimmings for upholstery purposes.

In the first of these it will be seen that, inasmuch as a needle can be worked at every inch and a half of a machine, and in a double row, there must be great economy in the execution of a pattern arranged so as to repeat at every inch and a half within the vertical range of the embroidering frame, that is to say, within the action of the pantagraph in its command over the rows of needles. The machine is therefore always worked at the greatest advantage when the full range of needles is brought into operation by small repeats, and at the greatest disadvantage when large repeats are worked, and thus a certain number of needles, or rather needle-holders or pincers, are idle. Thus in a pattern which is only repeated at every six inches, three pincers would be idle in every such space in the machine; and my own impression is, that with less than a dozen needles at work, the machine operates at a loss, or at least that there is no gain in the work, except in the matter of a double-sided pattern. The usual calculation is that with less than eight needles the work is executed at a loss.

This is, of course, one of the disadvantages of the machine in certain classes of the work; and except under certain peculiar arrangements of the design, there was always great difficulty in competing with hand labor, in the execution of the "collonade" fronts of ladies dresses at the period these were in fashion. On the contrary, in bordered and flounced dresses, hand labor had no chance with the machine.

As may be supposed, these machines presented an apparently insurmountable obstacle in the execution of a series of repeats in a curved line, which a few years ago was one of the problems yet to be solved. Mr. James Houldsworth, the present proprietor, however, has

overcome this difficulty in suitable fabrics, by constructing an embroidering frame for insertion into the machine, on which the fabric being stretched upon elastic cross pieces, and screwed up to the desired curvature, the design is embroidered in a right line, but when the fabric regains its original position on removal from the frame, this line becomes a curve, the reverse of the direction in which it was stretched.

Embroidery for dresses being comparatively out of fashion, the machines are chiefly used at the present time for furniture fabrics, such as window curtains, table covers, valences, borderings, and goods for foreign markets, of which there are before you some admirable specimens, all produced by Messrs. James Houldsworth & Co., of Manchester.

Some of the capabilities of the embroidering machine are shown in these examples. The work is clear, fine, and according to the character of the design, perfect in all its parts; whilst the advantage of having the pattern complete on both sides of the fabric must be apparent to every one, especially in table covers and window curtain borders. Here the peculiar action of the machine in driving the needles through at a perfect right angle, and returning them at the same angle, becomes of great value; not, after all, that the two sides are equally perfect, yet no unpractised eye would easily detect the difference. When, however, the hand embroiderer attempts this kind of effect, the amount of attention required to execute the work, with even a moderate degree of precision, renders the operation any thing but an economical one.

An example of work, as applied to linen and cotton fabrics, not previously attempted in these machines, has reached me to-day. When the operation is perfected by the necessary experience, the result will no doubt be satisfactory, as the style of embroidery is well adapted to a great variety of articles in ladies' dress.

In the matter of design as applied to machine embroidery, it must be evident that there are certain peculiarities about it which the artist, to be successful, must thoroughly understand.

The repeats of the pattern must all be either one inch and a half wide, or multiples of that width; that is to say, three, four and a half or six inches, and so on. The vertical range may be said to be unlimited, except by economy of production; for by means of the rollers on which the fabric is placed, the work can be carried even into stripes, as indeed, has been done when necessary. In making a working design, the length of stitch has to be carefully kept in view, and the angle at which the thread will lie when the work is seen as a whole. In hand embroidery this is also a condition, but in that great masses of these stitches may be brought together, which is a peculiarity of Eastern embroidery, and the effect produced by the contrasting angles at which the thread is inserted is often very remarkable, especially when different shades of the same tint or color have been employed. In machine embroidery this kind of effect cannot be imitated successfully or economically, and it is usual to keep each form

as much as possible to one, or, at most, two series of stitches. Shaded effects, however, are produced, as in the case of the dress embroidered for Her Majesty, the Queen, by dyeing the silk with a graduated tint or shade, by which the thread is dark at one end and gradually becomes light at the other end. Pleasing effects are thus produced in a very economical manner, even in what are called self-colored embroideries —say, on dark green merino, embroidered with silk shaded from dark to light green. These irregular effects of light and shadow are not, however, very legitimate when viewed artistically; but for this the manufacturer cares quite as little as the consumer. If the thing sells with the one, and "looks pretty" to the other, that is enough according to the art-creed of both.

There is yet another point which in the smaller patterns it is of considerable importance for the designer to bear in mind. Silk at 40s. per pound is too costly to be wasted, therefore it is desirable that each needleful should do its work, and that no fragments should remain to cut away at a loss. Hence patterns have to be designed to the needleful; and, if a pattern, however excellent in the abstract it may be, consumed one needleful and 36 inches out of two needlefuls of 42 inches each, it would be considered any thing but sound economy in machine embroidery to execute it, as eight inches of silk would be lost in each needle employed—a waste upon any extent of production which would astonish those who are not in the habit of thinking about mere fragments in the materials of manufacture. It will at once be seen from this fact that the designs for machine embroidery must ever be somewhat peculiar, and, to a certain extent, limited in range of form, and that all the more successful—certainly the most economical—are made almost in the presence of the machine by which they are to be executed, and, for the most part, under no higher inspiration than that of a species of artistic measure table, such as:—

Two needlefuls make one flower.

Three flowers make one repeat.

Twenty repeats make one border.

Four borders make one table cover decoration.

One can thus tell almost to an inch—certainly to a yard—how much silk will be consumed in a given operation.

It will now be asked, "Do these machines begin and finish their work completely?" Not absolutely; but so perfect is the work in a well-arranged pattern that, with the exception of the cutting out of certain ends used for starting points, the occasional fastening of other ends, and the insertion here and there of a stitch by hand, the work is practically finished when it leaves the machine. Experienced hand embroiderers, acquainted with the peculiarities of machine work, are, however, employed to look it over.

As a branch of factory labor for females, none is so healthy, certainly none more interesting.

The workers are generally the most intelligent of their class, and their wages are fully remunerative when work is abundant; but there is one great drawback in the economical working of these machines,

in contradistinction to that of most other manufacturing agents. The fashion for embroidery fluctuates very much. In times of increased demand there is great anxiety and much trouble in instructing even the generally intelligent girls who are desirous to get this kind of employment.

A sudden change of fashion throws the machines out of work, and with them the workers, and when a demand again occurs, fresh hands have to be instructed. Happily, there is less change in furniture fabrics than in dresses, and thus the best hands are retained ready for an emergency and the instruction of others; but the operative classes are now keenly alive to the disagreeable character of fluctuating employments, alike to employer and employed; and thus the difficulty is increased even to such a house as that of the proprietors of these machines, whose reputation as employers of factory hands has always stood so high.

In concluding this attempt to explain the mechanical principle and economic application of one of the most interesting agents which, in the progress of modern invention, has been brought to bear upon textile decoration, it is only right to state that the imperfections of the exposition are inherent in the subject, and nothing but a very earnest desire to comply with the wishes of the managing officers of the Society of Arts, that a popular explanation of the construction and peculiarities of the embroidering machine should be given to the members, would have induced me to undertake the task, under the many disadvantages which must necessarily arise out of the fact that my connexion with these machines, in a practical form, ceased ten years ago, and I doubt if I have seen them more than three times in the interval.

(To be Continued.)

The Explosion on the Great Eastern.

The cause of the explosion on the *Great Eastern* is thus explained in the Portland correspondence of the *London Times*, Sept. 11:—

"In order fully to understand, as far as it is yet known, the cause of the accident, it will be necessary to say a few words on the peculiar construction of the two forward funnels for the paddle boilers. In the first plans for the vessel it was determined, in order to economize the heat given off by the funnels, and to keep the saloons through which they passed cool, to fit them all with what is termed a 'feed pipe casing,' rising from the boilers to about eight feet above the upper deck. This feed pipe casing is simply a double or outer funnel for the length we have stated, the inner one, as usual, carrying off the smoke and flame, and the space between it and the outer casing being filled with water. The water is pumped in at the top of the casing while cold, and gradually passing down into the space round the furnaces, becomes greatly heated, when it is discharged into the boilers by means of an ordinary stop-cock. A plan by which so much coolness is supposed to be gained in the berths and saloons, and so much fuel

saved by the ample supply of hot water to the boilers, promises such obvious advantages that for the last ten years attempts of every kind have been made to carry out the principle successfully on board most of the sea-going steamers. In no one instance has the plan ever yet succeeded. In but too many cases the funnels have done what the funnel of the *Great Eastern* did on such a colossal scale last Friday evening. When such an accident has not occurred, the pressure of the column of water upon the base of the funnel near the furnaces has been so great as to cause them, when strained in bad weather or worn by long use, to leak into the fires and extinguish them more or less rapidly. Any one the least conversant with boiler mechanism will see, too, at a glance, that the safety of the whole affair depends upon the stop-cock which lets off the water into the boilers being watched with unremitting vigilance. The neglect of this for half an hour would allow steam to generate in the casing, which would then, in plain terms, become a gigantic boiler, without a valve or any means of letting off its steam, save by blowing up. This was the apparatus which, as I have explained, in order to economize heat and cool the saloons, it was proposed to introduce on board the *Great Eastern* in the three funnels to the screw engine, and the two forward funnels for the paddles. Messrs. Bolton and Watt were entrusted with the construction of the screw engines and boilers, and they at once firmly refused to have any such casing round their funnels, or attached to their engines in any way whatever. I am not aware of the precise reason on which they grounded their refusal, though doubtless they rested mainly on the obvious fact, that the plan had been tried over and over again and always failed, with more or less of inconvenience or disaster. The plan, however, was adopted for the two paddle funnels, though at about that time the Collins' line of steamers, which had tried the plan for nearly three years, discarded it as often dangerous and always worthless. The casings of the two forward funnels of the *Great Eastern* held each about seven or eight tons of water, and the forward one, at least, it is now evident, might have exploded at any moment during the voyage, when the grand saloon was filled with the visitors on board to listen to the admirable music of the ship's band."

The explosion is thus described by the same correspondent:

"The visitors who were passengers on board numbered about 100, and, as may readily be believed, included among them some of the most distinguished navigators, engineers, and scientific men in Europe. All, as usual, were assembled at dinner at about 5½ o'clock on Friday, when before the dessert came on, two gentlemen left the Chairman's table to look at the coast near Hastings. Mr. Campbell, the Marquis of Stafford, Earl of Mount Charles, Lord Alfred Paget, and a few others followed, without waiting for dessert. The departure of these gentlemen from the saloon, as it happened, broke up the dinner party, and instead of retiring to the grand saloon, as usual, nearly all the visitors came on deck, and went right forward in the bows. About 30 remained at table—a few were on the bridge with Mr. Campbell, and thus, by a most merciful interposition, it happened, for the first time

during the voyage, that there was no one sitting in the grand saloon, and no one on the little raised deck round the foremost funnel. One or two gentlemen were congratulating Mr. Campbell on the almost marvellous success of the ship, when in the space of a second there was a terrific explosion. The forward part of the deck appeared to spring like a mine, blowing the funnel up into the air. There was a confused heavy roar, amid which came the awful crash of timber and iron mingled together with frightful uproar, and then all was hidden in a rush of steam. Blinded and almost stunned by the overwhelming concussion, those on the bridge stood motionless in the white vapor till they were reminded of the necessity of seeking shelter by the shower of wreck—glass, gilt work, saloon ornaments, and pieces of wood, which began to fall like rain in all directions. The prolonged clatter of these as they fell prevented any one aft the bridge from moving, and though all knew that a fearful accident had occurred none were aware of its extent, or what was likely next to happen. After a short interval, during which the white steam still obscured all aft the funnel, Captain Comstock, who was on the bridge, tried to see what had occurred, but he could only ascertain, by peering over the edge of the paddle-box, that the vessel's sides were uninjured, and the engines still going. Gradually then, as the steam cleared off, the foremost funnel could be seen lying like a log across the deck, which was covered with bits of glass, gilding, fragments of curtains and silk hangings, window frames, scraps of wood blown into splinters, and a mass of fragments, which had evidently come from the cabin fittings of the lower deck, beneath the grand saloon. In the middle was a great heap of rubbish where the funnel had stood, from which the condensed steam was rushing up in a white, and therefore not hot, vapor, but enough to hide completely all that had happened below. In another minute all the passengers came rushing toward the spot. The 20 or 30 who had remained at table in the saloon next that which blew up came on deck also, and it will give your readers some idea of the gigantic strength of the vessel when I tell them that these latter until they actually saw the smash, were almost unaware of the terrific explosion which had occurred beside them. It was only the dull, heavy roar, followed by the rattling of fragments as they rained down on and through the sky-lights, which warned them that something dreadful had occurred. Still none knew what had really happened or what injury the vessel had sustained. Capt. Harrison, who was aft at the moment, rushed forward, and, seizing a rope, lowered himself down through the steam into the wreck of the grand saloon, and, calling to six men to follow him, began a search among the ruins for those who might have been below. The only one in the apartment was his own little daughter, who had just arrived at the after part at the moment of the explosion, and who, completely sheltered by the wrought iron bulkhead, had escaped, by a miracle, totally unhurt. Capt. Harrison merely gave the order to pass her up through the sky-lights, and continued his search. This was no easy matter. The wreck and rubbish piled in all directions in the ladies' small saloon, forward of the funnel, made it difficult to move about.

The steam hid almost every object; the place was broken, the floor in parts upheaved and riven, so as to show a still more frightful smash in the saloons and cabins below. Through these apertures the bright glare beneath the lower deck of all showed that the furnace doors had either been blown open or blown away, and the funnel being gone, the draft was down the remains of the chimney, forcing out the flames and ashes in a fierce and dangerous stream. This, as the embers touched water, sent up a close, suffocating air—half steam, half gas—in which it was difficult to see, and almost impossible to breathe.

In the meantime, most on board, including the visitors, took steps to restore order and confidence. As I have already said, there were fortunately no holiday tourists there, or the matter would have been much worse. Some of the ablest engineers and machinists were on deck, who could pretty well guess what had happened, and what worse might follow. A funnel, filled similarly to that which had blown up, was evidently getting intensely hot, and of those present none knew to what extent its "jacket," or outer casing, had been damaged, or how soon it might explode. Mr. Scott Russell, followed by one or two engineers, at once went below to the furnaces of these boilers, and ordered the steam to be blown off, the speed of the engines to be reduced, and every precaution taken to guard against mishap. Mr. Campbell remained calm and collected on deck, getting the crew forward and preventing any unnecessary alarm. Some of the men instantly went below to search for those employed in the stoke-holes, whom it was now evident must be fearfully injured, if indeed alive. Mr. Trotman, with one or two others, went below to the lower deck cabins, where one at least was known to be covered by the wreck, while Capt. Harrison came on deck and ordered the ship's course to be altered toward the land till it could be ascertained that there was no immediate danger from fire or injury to the frame of the vessel below. The former risk appeared to be the most imminent, as the flames were still rushing fiercely from the furnace doors. The hose was therefore ordered to be laid on, and instant preparations made for extinguishing the fires.

The hose was got at once into play, and a stream of water was poured down into the stoke-hole beneath the lower deck, so as in a few minutes to quench the fire in the furnaces, and put at rest all fear of danger from that source. Within twenty minutes after the blow-up the real cause and nature of the mishap was known, and the total safety of all the engines and after boilers was definitely ascertained. Fearful as was the explosion, it was seen that, owing to the immense strength of the ship, its violence had been entirely confined to the compartment in which it had occurred, and it was determined to resume the original course and steer for Portland. All danger from fire or another explosion being now at an end, those who chose were enabled to go down and examine for themselves the scene of the disaster. The litter on the deck showed that in the compartment in which it had taken place, and where it was confined by the wrought iron bulkheads, it had been wide and general. The fore part of Mr.

Crace's beautiful saloon was a pile of glittering rubbish, a mere confused mass of boards, carpet shreds, hangings, mirrors, gilt frames, and splinters of ornaments; the rich gilt castings were broken and thrown down, the brass work ripped, the handsome cast iron columns round the funnel overturned and strewed about. In the more forward part, a state sitting-room for ladies, every single thing was destroyed, and the wooden flooring broken and wrenched up. What the consequence would have been if it had taken place an hour later, when the visitors would be sitting in the saloon, is almost fearful to think upon. But the damage in this part seemed a mere bagatelle when compared with the ravages among the lower deck cabins beneath. It was difficult to go down there, for the whole place was filled with fragments of boards, chairs, beds, cabin fittings, broken steam pipes and syphon-tubes, torn-out rivets, and masses of the inner and outer funnels rent to pieces like calico, and lying about like heaps of crumpled cardboard. Everything was in literal fragments. The course of the explosion could then be seen at once. The water, or rather steam, in the casing had crushed in the inner casing, blowing up the funnel above deck, while both funnels below it were torn to pieces, and hurled about, sometimes in single rivets or scraps no longer than one's hand, sometimes in crumpled up lumps weighing several hundred weight. Beneath this deck, toward the stoke-hole, where the remnants of the funnel left a yawning hole like an extinct volcano, the force of the explosion was still more manifest. Not only was the iron compartment nearest to the boiler partly rent and pushed back, but one of the main deck beams, an enormously massive wrought iron girder about two feet deep, and strengthened with angle irons, was wrenched back and nearly bent in halves. In some parts the explosion seems to have acted with the capricious violence of lightning. Thus, in the grand saloon the two largest mirrors on each side of it, running fore and aft, were quite unbroken, though the silvering was boiled off the backs of both by the heat of the steam. By the side of these glasses cast iron columns were bent and broken, and mirrors at four times the distance from the seat of the disaster were almost pulverized, and their framings even destroyed. The beautiful oak stair-cases descending to the saloons were blown up like card-work; yet not a book on the library shelves, close to the funnel, was stirred. At the bottom of the stoke-hole I found one of the gilt framings, which were placed round the windows of the saloon; it was perfectly uninjured. For your readers to understand this singularity they must suppose one house—say number eight—to have had an explosion in its cellar, and among the ruin is found uninjured, a drawing-room picture belonging to the next door neighbor at number nine. The boiler, so far as can be judged from a superficial examination, stands firm; a close scrutiny, however, will be necessary to enable the engineers to determine whether any part of it, more especially its tubes, are injured. It seems almost too much to hope that when such a severe concussion was experienced, it can have escaped entirely without injury. Near and upon the boiler lie scraps

and morsels of the funnels, which show where the first tearing away commenced before the inner casing was blown up to the deck.

The Coroner's inquest on the bodies of the five unfortunate stokers —John Boyd, Michael Mahon, Michael McRoy, Robert Adams, and Richard Edwards—was held at the Town Hall at Weymouth, before Mr. Henry Lock, the Coroner for Dorset.

The first witness examined was James Briscoe, the junior engineer of the paddle engine department, who said that it was his duty to attend to the direction of the engineers in charge of the paddle engines on duty, and to render assistance under their direction. He was told not to meddle with or make himself responsible for any of the cocks or valves. The donkey-engine which pumped into the boiler was out of order, and did not perform its duty satisfactorily. The donkey-engine on the port side of the ship in the forward stoke-hole had broken down. One minute before the explosion, Mr. M'Lennan, the Chief Engineer of the ship, came down to witness, and looked to the saturation of the water in the boilers, and said, on leaving, that everything seemed right; knew that the bursting of the water-heater round the forward funnel caused the explosion. At the time of the explosion, the boilers were not being fed from the casing, which was evident from the low temperature of the water going into the boiler. They had ceased to feed the boilers from the water casing, he believed, to get a greater amount of water into the boiler. If the water casing had been regularly kept supplied with water, and a continual flow in and out, the accident would not have happened. There were two stand-pipes to the water casing, which, if open, would have prevented it.

Mr. Brenton, one of Mr. Brunel's principal engineers, was called to give evidence to the probable cause of the accident. Witness was accompanied in his examination by Mr. M'Connel (the Engineer of the North-Western Railway), Mr. Scott Russell, Mr. Smith (the inventor of the screw-propeller), Mr. W. Smith (a civil engineer), and Mr. Bates, who represented the firm of Bolton & Watt. Witness and those with him came to a conclusion as to the cause of the accident. The double funnel casing was not always applied to other steam boilers. The fact of the wood-work around the funnel being blown away led witness to see the cause of the accident without the drawings or explanations.—They ascertained that the funnel was double for 40 feet of its length, the inside one being 6 feet in diameter, and the outside one 7 feet, leaving a space of 6 inches between the two all round. The water was contained between the two; the explosion took place about half way down, near the lower deck. The inner casing was collapsed, and the outer one burst out. The object of the casing was to prevent the water being led direct to the boilers. There was an apparatus provided to prevent any excessive pressure accumulating in the water-jacket. This apparatus consisted of a "stand-pipe," which was carried to near the level of the top of the funnel, and communicated with the water-jacket, constituting a safety-valve. Being open at top, as soon as the pressure increases it runs out of the "stand-pipe." The height of the column of water regulated the pressure in the jackets. From inquiry, they

learned that the feed-water for the boiler was sent direct to the boiler, without passing through the funnel, as the donkey-engines did not work satisfactorily; one of them being disabled, the other had to do the work of two. That accounted for the fact of the communication between the boilers and the casing being shut off. An explosion ought not to have occurred if the "stand-pipe" was in operation. Their attention was called to the state of the stand-pipe, and they found at the bottom of it a plug capable of being turned. It was shut off, leaving no vent for the steam generated in the case. If the "stand-pipe" had been in operation, or if the feed was continued through the jacket, the explosion would not have occurred. The steam must have gone on generating till the cylinder burst. No one seemed to know how, when, or by whom the cock was shut. Two or three days before the ship sailed, the "stand-pipe" not being high enough, a piece was added to it, so that up to that time the cock must have been open. It was supposed to have been closed by some workman for some purpose, and not to have been again opened. If the cock had been taken off, the accident could never have happened. The cock was put on to test the cases by hydraulic pressure, and had not been removed. The cock could not have been closed by the force of the explosion, or, indeed, witness could not conceive the accident occurring.

The inquest was resumed next day, Mr. John Scott Russell having come from London to be present.

Mr. John Dickson, foreman to Mr. Russell, and under whose superintendence the machinery of the paddle engines was fitted, was also present, and Mr. M'Lennan, the Chief Engineer of the *Great Eastern*.

The Coroner said that, on the opening of the inquest, he at once considered that it was a case which ought to be adjourned, in order that the Jury might have the assistance of some of the surveyors from the Board of Trade. He had accordingly communicated with the Board of Trade, and received a letter in reply the previous day, which stated that it was impossible that Capt. Robertson, the Surveyor-General, could attend the inquiry before Saturday next. He therefore thought that, under those circumstances, it would be most advisable that the Jury should have the benefit of the experience of those officers, and, with their permission, he would adjourn further proceedings till Saturday morning at nine o'clock. He (the Coroner) trusted that both the Company and Mr. Scott Russell would be ready on that occasion with any evidence which could throw the smallest light upon the causes which had led to so disastrous an accident.

Mr. Scott Russell said that it would be proved by witnesses that the cock of the valve was open on Tuesday, and when the vessel left the river on Wednesday.

The inquiry was then adjourned till Saturday morning.

The interest evinced by the public in this part of the country in all relating to the ship seems as great as ever. Nearly 6000 persons paid their half-crowns to go on board, and promenaded the deck all day, defying the squalls of wind and rain with an endurance worthy of a better cause.

The repair of the damages inflicted by the explosion has already commenced, Mr. Scott Russell having contracted to restore the whole for £5000. If it should turn out that either of the forward boilers have been injured, £5000 will scarcely suffice for the entire restoration.—From the fact of there having been no escape of steam from either of the boilers at the time of the explosion, when there was a pressure on each of 22 lbs., it is believed that they have escaped without material injury. The mere joinery of the cabin fittings and the redecoration of the grand saloon can, and doubtless will, soon be completed. With the ironwork, however, it is a different affair. All this must be executed in London from the working drawings of the vessel, and sent down piece-meal by rail to Weymouth, where it can be bolted together on board the ship. Mr. Scott Russell's contract is to finish the whole ship in her former state as she left the river, within three weeks.

New Action of Light.

The Abbè Moigno gives us still a new and curious result of the researches of M. Niepce de St. Victor. If a solution of starch or dextrine be subjected to the action of solar light for a short time, (say for a quarter of an hour, if there be but a very small quantity of matter) it will be found to be completely changed into glucose, (grape sugar) whose presence is easily recognised by the ordinary reactions; and even by its sweet taste. M. Niepce thinks that he has determined that by surrounding the bunches of grapes in the early part of autumn by bags of white paper dipped in tartaric acid, not only their ripening is hastened, but the quantity of sugar which they contain is greatly increased. Tartaric acid is now well-known to have the power of *storing up* the light in the condition of chemical efficacy.

Cosmos, 1st July, 1859, p. 12.

Approximate Quadrature of the Circle.

We take from the *Cosmos* the following pretty geometrical construction for an approximate quadrature of the circle:—

Describe the given circle, and let A B be a diameter. From A set off the quadrant A C, and from C set off in the same direction an arc A D = 60°. Bisect the chord D C in E; and from A draw A E, and prolong it until it meets the circumference in F. Then will A F be the side of a square whose area is approximately equal to that of the circle.

The difference of the areas is about $\frac{1}{3747}$.

The Use of Soluble Glass for Preventing Combustion of Wood.

The English government have caused experiments to be made on wood prepared in the following way: first, it was painted over with two or three coats of a feeble solution of the glass (1 vol. of the

siropy solution to 3 of water). The wood absorbs this freely. When these coats were nearly dry, a coating of ordinary whitewash was given, and, when this again was nearly dry, it was fixed by a stronger solution of the soluble glass (2 vols. of sirop to 3 of water). A second application of this will not be necessary, unless the whitewash has been too thick.

The experiments showed that wood thus prepared is almost incombustible, and that it does not scale or split off when the wood becomes hot; rain has no action on it; a long exposure to a powerful jet of water partially washed it off. One pound of soluble glass was sufficient for a surface of a square yard.

For the Journal of the Franklin Institute.

Particulars of the Steamer De Soto.

Hull built by Lawrence & Foulkes. Machinery by Morgan Iron Works, New York. Intended service, New Orleans and New York.

HULL.—

Length on deck, from fore part of stem to after part of stern post, above the spar deck,	252 feet.
Breadth of beam at midship section,	38 " 8 inches.
Floor timber, at throat—molded, 16 ins.—sided, 14 ins.	
Frames—apart at centres, 28 inches—strapped with diagonal and double laid iron straps, 4 × ⅜ inches.	
Depth of hold,	19 " 2 "
" to spar deck,	26 " 8 "
Draft of water at load line,	15 "
Area of immersed midship section at this draft,	530 sq. ft.
Tonnage, custom-house,	1600.
Masts and rig—Brig.	

ENGINE.—Vertical beam.

Diameter of cylinder,	65 inches.
Length of stroke,	11 feet.
Maximum pressure of steam in pounds,	20.
Cut-off—half stroke.	
Maximum revolutions per minute,	18.

BOILERS.—Two—Single return flued.

Length of boilers,	27 feet.
Breadth "	12 "
Height " exclusive of steam chimney,	10 "
Number of furnaces, (3 in each.)	6.
Breadth "	38 & 44 "
Length of grate bars,	7 " 6 "
Number of flues,	36.
Internal diameter of flues,	8, 10, 11, 12, 13, and 16 in.
Length of flues,	19 ft. 6 in. and 13 " 3 "
Diameter of smoke pipe,	6 " 6 "
Height "	32 "
Description of coal,	Anthracite.

PADDLE WHEELS.—

Diameter,	30 "
Length of blades,	9 "
Depth "	18 "
Number "	26.

C. H. H.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, September 15, 1859.

William B. Atkinson, President P. T., in the chair.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

A letter from the Mercantile Library Association, of the City of New York, was read.

Donations to the Library were received from the Institute of Actuaries, London; the Commissioners of Patents, Washington, D. C.; the Mercantile Library Association, City of New York; Profs. J. C. Cresson and J. F. Frazer, and Messrs. Jones, White, & McCurdy, and H. P. M. Birkinbine, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement of the receipts and payments for the month of August, was read.

The Board of Managers and Standing Committees reported their minutes.

The Committee on Exhibitions reported that, at their stated meeting held August 9th, they awarded a first class premium to Appleton, Tracy & Co., of Philadelphia, for their American Watches, and to John F. Mascher of Philadelphia, for his Railway Timing Clock, on the reports of the Committee on Science and the Arts.

Candidates for membership in the Institute (6) were proposed, and the candidates (5) proposed at the last meeting were duly elected.

A number of photographic views of the extension of the Philadelphia Water Works, were then presented by H. P. M. Birkinbine, Esq.

Mr. P. Shreiner presented his patent stove, which he illustrated by a model and drawing, and explained as follows:—It does away the objection usually made to iron cylinders, by forming *air-tubes* out of a portion of the cylinder, and causing a strong current of air to pass along the cylinder to the drums placed in the interior of the furnace. This is perfectly gas tight at the top, and by an increased rush of cold air through the tubes, prevents the cylinder and drums from becoming red hot, thus securing a more healthful heat. By retaining in a cylinder or chamber above the fire-pot, and taking it rapidly out of the retainer, by the introduction of cold air by means of an extra cylinder which surrounds the retainer, the heat is prevented from escaping through the smoke-pipe, but is distributed through the apartments of the building. The smoke and gas are consumed by being compressed or forced back in contact with the fire. The gas being consumed, one source of destruction to the chimney is removed—the formation of sulphuric acid by admixture with the oxygen of the air.

He also showed how his invention radiated the heat in direct lines from all parts of its surface, and, by being encased, produced a double air heater. An ordinary heater with but capacity sufficient to heat

one room, by his improvement, can be increased in heating power so as to produce sufficient to heat an additional room of equal dimensions above. He claims a great saving of fuel, and freedom from dust in the room in which it is placed.

It is equally advantageous for cooking purposes, but want of time has prevented the inventor from furnishing models elucidating all its advantages.

One has been ordered, and is now being prepared, for the State Normal School at Millersville, Lancaster County.

Mr. Raif exhibited a small model of a machine to print the names of subscribers on newspapers, &c. It is a series of type boxes on an endless band; and, by depressing a lever, the letters are inked, and the paper brought up, printed and pushed off, ready for the next.

Mr. I. N. Coffin exhibited a Batchelder's Lamp for burning coal oils without a chimney, for which he obtained a patent Dec. 28, 1858. He stated that this lamp is designed for burning all kinds of coal oils without employing the common glass chimney, and thus avoiding the expense of their breaking and the inconvenience of the lamp getting out of order from that cause, and also to obtain the greatest amount of illumination from the combustion of a given amount of oil. The invention consists in the use of tapers or wick tubes, placed below and on both sides of a flat wick tube or main illuminating burner, in combination with a suitable cap, thus supplying sufficient oxygen completely to burn the oil without a chimney, and also without raising the cap so as to obscure a large portion of the flame. The lower part of the cap is screwed upon the lamp in the usual manner. Above this is a reticulated ring for the purpose of admitting air under the wick cap, which is slotted at the top to fit a flat wick. This ring is removable for the purpose of cleaning. By the contraction of the cap near the top, the air is concentrated upon the flame. Into the lower part of the cap are inserted the usual wick tube, and likewise two very small and short wick tubes. By this arrangement, the lamp when trimmed and lighted, has a stronger draft on account of the tapers in the short tubes; consequently the outer cap may be lowered upon the main wick tube, so that the illuminating flame is almost entirely above the cap. In other lamps where the draft is to be produced by the wick cap alone, it is necessary to elevate this cap so as to give a considerable volume of heated air in the upper part of the cap, in order to create sufficient draft; but this elevation of the cap obscures more of the flame and lessens the illuminating power of the lamp. On the contrary, by the use of the small draft lights, the top of the cap may be adjusted about half an inch lower upon the illuminating burner without causing the lamp to smoke; consequently it is practicable to secure a greater illuminating power from a given amount of oil, and to dispense altogether with glass chimneys, which are liable to break, difficult to keep clean, and otherwise objectionable. For further information, letters, or orders for the lamp, or for County or State rights of the patent, may be addressed to Isaac N. Coffin, care of Dr. William B. Atkinson, No. 215 Spruce Street, Philadelphia.